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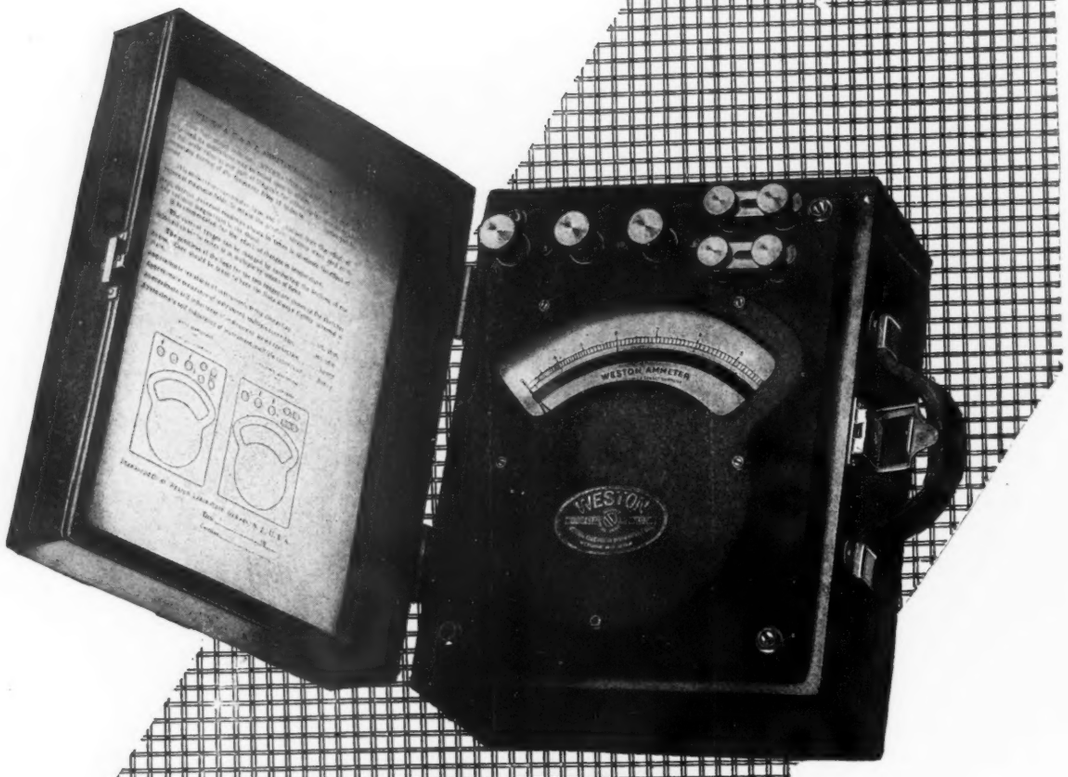

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Vol. 72, No. 11 New York, September 14, 1918 *Pages 481–528*

Electrical World

F. M. FEIKER, *Editorial Director* W. H. ONKEN, JR., *Editor*

Member Audit Bureau of Circulations, Member Associated Business Papers, Inc.

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Circulation of this issue 19,500 copies

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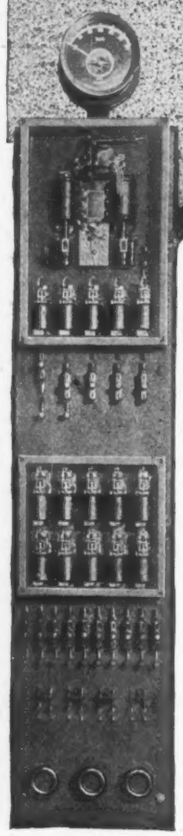

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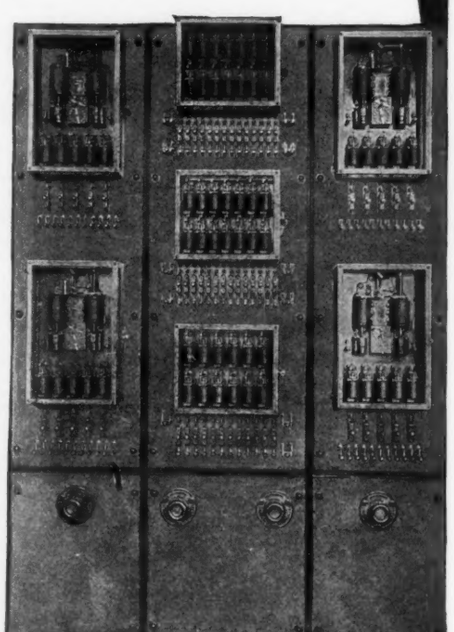

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Electrical World

The consolidation of ELECTRICAL WORLD, ELECTRICAL ENGINEER *and* AMERICAN ELECTRICIAN

Volume 72 New York, Saturday, September 14, 1918 *Number* 11

Looking Ahead on Rate Making

SO LONG as the winning of the war is our chief concern it appears likely that changes in central-station rates will in the main be simple flat advances to meet in part the burden of heavier operating costs. Time and money are too valuable at present to be spent in extended readjustments of rate schedules. Man power is needed by the nation for far more serious purposes. Within the central stations the production and distribution of energy indispensable for military and civilian uses is the insistent problem. It does not leave room for too minute a consideration of rate matters. Desirable and urgent as such detailed consideration may be, it can await other days. No one complains of this condition. It is a small part of the cost of our war for liberty. Every central-station manager, however, should see to it that this is clearly understood in his organization, perhaps also outside of it, as one of the acute questions to be taken up just as soon as possible. When things are again normal and staffs are reconstituted in the old or enhanced strength there will be opportunity to investigate the schedules in the light of the conditions which have been developing during the war period and will prevail as that period ends. Radical revisions in conditions of demand in the last few years have not been fully recognized in rate making. And other sweeping changes of far-reaching economic effect may be anticipated in the peace era.

We cannot figure with certainty that the return of peace will mean the return of the old conditions for the industry. The transformation wrought by these stirring years will not be undone in a day. Under the stimulus of the war demand the central stations of the country have gone ahead, not with the old steady rate of annual progress, but by tremendous leaps. The doubled output in four years tells the facts eloquently. In the old times it was, say, a 10 per cent yearly increase that expectation and realization saw. The schedules, the financing, the working forces were arranged with about that annual growth in mind. In general, the new-business policy which was followed was that of building up gross volume of production, of getting all the business of the community on the lines, of apportioning rates only roughly among the different classes of consumers. These methods, carried out intensively with more thoroughness year after year, developed the latent possibilities in factory, store and home. It was because of these methods, because of "mass production," that the central stations were able to meet the loud call for energy for war uses.

War brought many effects in its wake which are powerfully felt now and will in future have some bearing on total operating cost. The dislocation of material and labor costs and supply will be overcome only gradually. For this condition now there is but one quick and sure remedy, a flat advance in rates, not scientific, because industry is still too much disarranged for correct appraisal of the different factors involved. The flat increases take care, in part at least, of the immediate need for more revenue to prevent the threatened overwhelming of net revenue by the high tides of cost. They are emergency advances and in fact are distinctly so regarded by some of the public service commissions which have approved them. What the companies will need when our industries undergo reconstruction for peace conditions is not alone emergency action but the willing and generous coöperation of the governing authorities in meeting a situation as to which no precedent exists as a guide.

Higher Plane for Geographic Sections

THE formation last week of a joint council composed of five San Francisco sections of national engineering societies marked an important advance toward a higher plane of usefulness for the engineer. Of late local sections have been growing in importance and influence, particularly in Western territory where members are too far from headquarters to feel that local conditions could be thoroughly understood by the parent society, and now it is not unusual to find members of really live sections feeling that they derive more benefit from the local than from the national body.

Certain it is that the local organization can do effective and much-needed work for the advancement of the profession. A section organized and officered so that it can grasp and successfully cope with local problems involving the betterment of conditions under which the profession works is of far greater benefit to its members than one which limits its activities to technical discussions. The sphere of the engineer is rapidly broadening, and to keep abreast of the times the technical society must likewise adopt a broader viewpoint and render service in keeping with the real needs of the engineer.

Evidently the San Francisco associations are doing this. The first official act of the newly formed joint council was to bring before the Governor of the state the advantage of appointing an engineer to fill a vacancy on the state utility commission. With a body of about 1100 engineers in the San Francisco region agreed

on the advisability of such a move, it will be difficult for the Governor to ignore the suggestion. Many other lines of activity in which the several societies have common interest are being considered by the joint council, and the attention of local sections in other parts of the country will doubtless be directed toward that body. There is no reason why joint councils should not be formed in other cities where there are several sections. In San Francisco the idea began at a luncheon attended by the several secretaries and with enthusiastic support speedily developed in a way that promises to strengthen the position of the individual engineer, the local section and the parent society.

Conservation in Incandescent Lamp Practice

THE program of the Fuel Administration for effecting saving through improvements in current practice regarding incandescent lamps represents the result of careful study of the whole situation by a committee of those who knew the facts. The report on the subject which we gave in our last issue is substantially the basis of the policy of the Fuel Administration and really represents the kind of conservation which is of permanent value. It is not enough to make a flamboyant showing of economy unless the saving effected is based on sound principles of permanent applicability. One can, of course, cut down the use of fuel in electric lighting by abolishing the lighting according to some arbitrary schedule, but all that can be saved both to the coal pile and the consumer by skillful adaptation of means to ends is clear gain. The committee charged with the duty of providing a scientific and sound basis for energy saving in incandescent lighting represented substantially all the organizations supplying either electricity or material for incandescent service. It was a thoroughly well organized and representative committee, and the program recommended to and now followed by the Fuel Administration will certainly be of very direct value from every standpoint in lessening waste of energy and instituting a useful program of standardization.

The main points of the committee's program include the abandonment of certain sizes and types of lamp for which there is no serious need, the substitution of highly efficient units for those of less efficiency, and a campaign of education to enforce the suggested improvements. Broadly, it is advised that the multiple carbon lamp be virtually abandoned except in the few cases where owing to exceptional danger of breakage from shocks the heavy carbon filaments may prove advantageous. It is also recommended that the graphitized-filament lamp be generally abandoned and replaced either by tungsten lamps or by carbon lamps as just stated. This is a particularly sound program, since both the carbon and graphitized-filament lamps have persisted to an extent that is altogether unjustifiable. Unless for very special reasons, there is no occasion now to use anything except metallic-filament lamps.

Tending along the same line of general economy is the recommendation that the use of small metallic-filament lamps be so far as practicable abandoned in favor of the employment of a smaller number of larger and more efficient units. It is, of course, well known that the difference in efficiency between the large and small lamps is very material, and the development of scientific illumination has gone far enough to enable the larger units to be used very advantageously. Finally, as to the material of illumination it is recommended that the use of the vacuum-type metallic-filament lamps in sizes of 100 watts and above be eliminated in favor of gas-filled lamps. This is perhaps the most striking of the suggestions embodied in the present scheme. It now seems to have been well demonstrated that the gas-filled lamp of 100 watts and above represents so material a gain in efficiency that the time is ripe for a general change in practice. Better and better results have been obtained from the moderate sizes, and the point at which the line is now drawn seems a safe one.

The change from vacuum to gas-filled lamps is not a slight one from the standpoint of illumination. The concentrated filament of the latter type with its very high instrinsic brilliancy demands more careful and thorough shading than with the older form of lamp. In this are involved certain inconveniences and some not negligible losses in efficiency owing to the necessity of more thorough screening. It will require some little study to determine just what the final result will be from the standpoint of illumination. We are not sure that the practical economy attainable will be substantial at the limiting size set. The high temperature reached by the gas-filled bulbs is also an inconvenience in going to the smaller units, and this, rather than the matter of efficiency, is likely to be the practical limitation on the universal use of the newer lamp. It is clear that for the present the change may involve some actual increase in the cost of service for which the public service corporations may properly ask opportunity to recoup themselves. It is worth noting that the committee did not think it practicable to make any broad recommendation with respect to the more general use of the smaller sizes of vacuum tungsten lamps, say those up to 25 watts. This has been one of the favorite suggestions for economizing electricity, and when the smaller lamps are used with discretion in suitable places real gain can be made by employing them. Any general pressure brought to bear in their favor, however, would almost certainly tend to lower the resulting illumination undesirably, for the substitution would generally be made socket for socket.

The committee emphasizes the necessity of cutting out extravagant and wasteful use of light in every form and strongly recommends a propaganda of caution in this respect, with the warning that there is some danger of overdoing the matter, particularly in the case of industrial plants where output might be curtailed or injured by too great enthusiasm merely for saving electricity. Indeed, there is very strong probability that in certain cases there would actually be, because of lessened efficiency, a greater total use of fuel resulting from excessive zeal in reducing the quantity required for lighting. The program of the committee on the whole is an exceedingly sound one which will tend very greatly to cut down waste of energy and therefore save output acutely needed for other purposes. Reduction of illumination in itself is likely to be disadvantageous, but all the saving which can be made by the use of efficient methods of lighting is clear gain.

Small Units for Light Loads

IT IS, of course, a widely understood engineering fact that the efficiency of most power-producing and power-delivering machinery falls off very rapidly with the decline of the load upon that particular piece of apparatus. The relation between efficiency and load factor, in other words, is fundamental in importance. One of the chief duties of a first-class operating engineer, therefore, is to see to it that so far as practicable his machinery shall not be allowed to run for extended periods on uneconomical loads. With reference to boilers, engines and turbines, whether of the steam-driven or water-driven type, this close watching of output variations on a given unit may be said to be general practice. It would perhaps be hard to prove it, but is the engineer quite so particular about the relation between loads and capacities in the operation of auxiliary machinery and of equipment on distribution systems under his supervision?

We mention this point at this time, not because it is new in principle, but because the importance of fuel saving justifies renewed attention to all possible methods of securing economical service. Without spending any great amount of money for equipment, many an operating engineer can accomplish fuel savings of real moment if he is willing to put himself a little more "on the alert," as the French say, to anticipate load changes and to cut off capacity not needed at the earliest possible moment. Now is surely the day for some first-class "Yankee guessing" as to the time at which units of different sizes can be removed from the line without hampering the quality of service or making the efficiency take a turn for the worse. Often it may be possible by carrying a little stiffer overload on a unit for a few minutes to avoid starting up another machine, or to get ahead of the game a bit by cutting it off a few minutes before the usual time. Every quarter-hour of unnecessary operation counts to-day on the fuel bill, and the present high price of coal, as well as its threatened scarcity, justifies a much closer watch of the time schedule of main machines and auxiliaries than used to be common.

As the fall loads come on, the time will be ripe to study more intimately than before the daily performance of units of different sizes as well as the total operations of the plant from hour to hour. Shortening days are now beginning to be felt on the curve of lighting output in central stations, and it will not be long before early twilights will influence the production required in industrial power plants. The forthcoming change of time back to the old standard will make sharper watch of outputs and service pay.

The Use of Synchronous Condensers

NOTES by J. T. Peyton regarding some recent practice of the Duquesne Light Company are instructive in view of the emergency requirements impressed on electric supply stations. The case described in this issue is one of a kind not unfamiliar. Great calls for extra load on lines already in place involve troublesome problems not only of line regulation but of station capacity as well. No thoroughly successful method has yet been worked out for control of power factor in connected load. To a certain extent it can be regulated by supervision of apparatus, but to-day the installations have to consist not of what one would wish to have but of what one is able to get at short notice. Had the company foreseen what would fall upon it it would very likely have installed more copper or raised the voltage of its lines, or both, so that the situation could have been dealt with. Under existing circumstances a study of the situation showed that the cheapest way out of a troublesome difficulty was to fall back on the synchronous condenser for regulation of voltage and power factor.

Such use of sychronous machines is familiar enough; in fact, it runs back to the very beginnings of electric power transmission and was worked out in connection with one of the very first three-phase plants ever installed. But it is only within comparatively recent years that the employment of synchronous machines as regulators has become common. In this instance a 7500-kva. unit was installed with extremely beneficial effect, enabling the voltage to be held constant under a very widely varying load and the power factor to be kept up to approximately 90 per cent. The results have been very gratifying in enabling the large and somewhat difficult load to be handled easily without increase in line copper or at the generator station and with an accuracy of voltage regulation otherwise unattainable.

Sometimes transmission systems are fortunate enough to take on big synchronous motors which in themselves can serve the double function of helping out the power factor and providing useful load. Rather frequently just now, however, one meets the condition here faced of getting caught between the devil and the deep sea, between difficulty of getting generating equipment and line material and the requirements of new and difficult loads. For such cases the synchronous condenser affords a ready way out and, furthermore, machines utilizable for this purpose may not infrequently be picked up for prompt delivery, inasmuch as they are not subject to troublesome requirements of speed or starting torque but are operated quite independently in their own peculiar function.

The Coming Issues

EVEN before war was declared by the United States the electrical industry of the country had taken steps to place itself on a war basis. Since then no industry has made a stronger effort to aid the government in its fight for humanity. The manufacturer has turned out equipment to the limit of his capacity, thereby enabling the government to launch its war machine so quickly. The central station demonstrated early that electric power was the one source of energy on which full dependence could be placed. The jobber made it possible for the government to secure in a few hours what it otherwise would have taken weeks and months to obtain. In fact, always has the army of the electrical industry been a full 100 per cent behind the army in the field. This is the story of the next issue of the ELECTRICAL WORLD, the second National Service Number of the paper.

High-Power Factor Induction Motors

Summary of Various Arrangements for Variable-Speed Motors of the Above Description That Have Been Proposed in the Last Fifteen Years, with Particular Reference to French Developments

BY MARIUS LATOUR
Paris, France

NUMEROUS methods have been proposed in the last fifteen years for obtaining high-power-factor, variable-speed induction motors. Therefore it may be worth while to present a simple classification of these arrangements in order to clarify the present state of development and furnish a better basis for further work.[1] The proposed review of the subject has, moreover, some relation to that made by the author on the subject of "The Compounding of Alternators" (see *Bulletin* of the Société Internationale des Electriciens, May, 1917); for it so happens that the same diagrams have been resorted to, these being applicable, according to the purpose in view, for the compounding of alternators, for devising self-exciting induction generators, for raising the power factor of induction motors, and for regulating their speed.

The summary which the author purposes to make relates to the study of the variable features of induction machines having collector rings; so it is necessary to begin by defining what is understood by the term "induction machines," also called "non-synchronous machines." The ordinary synchronous machine (such as a synchronous alternator or motor) being one whose speed is absolutely fixed by the number of poles and the frequency of the supply current, it might be understood that the induction or non-synchronous machine is one which operates at other than synchronous speed and which cannot work at synchronous speed. The ordinary induction motor with a short-circuited rotor is usually thought of as an example of an induction machine, but this interpretation would not, the author thinks, correspond to the modern idea of induction or non-synchronous machines, since this conception would not include induction motors having special modes of excitation.

The non-synchronous character of a machine may be defined from the following point of view. When an ordinary synchronous machine is connected to a circuit the amount of torque exerted on its shaft is regulated by the angular lead or lag of the rotor with respect to the synchronous revolving field developed by the stator. If the machine loses speed, its operation is interfered with. In fact, as a synchronous machine it will not of itself return to the speed at which it can and must operate; it will "fall out of step." In contrast with these operating characteristics of the synchronous motor, we may say that the non-synchronous or induction machine is one in which the torque on the shaft corresponds to the speed of the rotor itself, and in which, consequently, variations of speed alone can produce the disturbances which are produced by variations of angular lead or lag in the case of a synchronous machine. The non-synchronous character of an induction machine is thus defined by an operation which bears a close relation to that of the continuous-current machine.

The proposed definition does not exclude synchronous operation itself from the conception of the induction machine. It is only necessary that the condition of synchronism should represent a speed which is susceptible of being lost and recovered without special complication. This definition does not go further into the question of whether the non-synchronous machine is one operating as a motor, or as a generator, at a given speed which is above or below synchronous speed.

TWO METHODS OF OBTAINING HIGH-POWER FACTOR, VARIABLE-SPEED MACHINE

On the assumption that this definition is correct, there are two ways practically of obtaining a non-synchronous machine having a high power factor and running at variable speed when operated as a motor. These are: (a) The rotor may be connected with auxiliary commutator machines which have no relation with the supply circuit and which can turn at a speed independent of the rotor; or (b) the rotor may be joined with special machines connected with the supply circuit in such a manner that there is an established relation between the supply circuit and the rotor, as may be done by the interposition somewhere of a commutator moving synchronously with the shaft of the rotor.

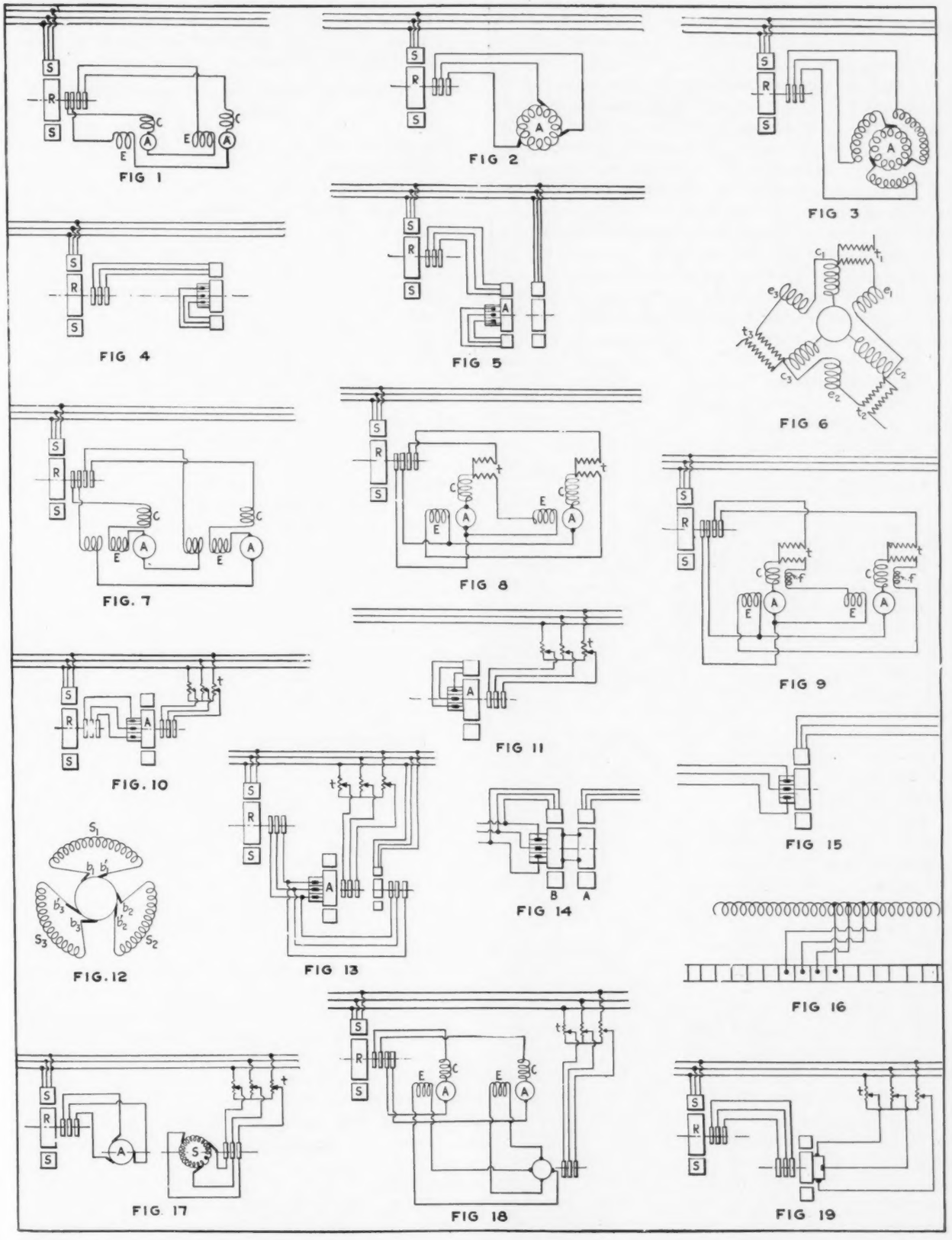
In the case of arrangement (a) the non-synchronous machine cannot operate at synchronous speed. It will work as a motor above synchronism and as a generator below synchronism. In the case of arrangement (b) the machine can operate at exact synchronism and it can also operate indifferently, either as a motor or as a generator, both above and below synchronism.

INDUCTION OR NON-SYNCHRONOUS MACHINES OF TYPE "A"

It was Maurice Leblanc who first proposed to connect the rotor of an induction motor with a machine having a commutator (1895). He originally proposed to connect condensers with the rotor of induction motors in order to improve their power factor, but because of the practical difficulties experienced in obtaining condensers of sufficient capacity he sought to devise dynamical arrangements capable of being used in place of condensers.

The original arrangement used by Mr. Leblanc is shown in Fig. 1. The induction motor *SR* is supposed to comprise a two-phase rotor which is connected in cascade with two single-phase machines, one with each phase. The armature *A* and the field *E* of the same single-phase machine are connected with different phases of the rotor. The diagram has been modernized

[1] The idea of writing this paper came to the author after a conversation with André Blondel in regard to the recent paper of R. V. Picou on "An Induction Motor Having a High Power Factor and a Variable Slip." (See *Bulletin* of the Société Internationale des Electriciens for December, 1917.)



DIAGRAMMATIC REPRESENTATION OF THE VARIOUS METHODS DEVELOPED FOR PRODUCING A HIGH-POWER-FACTOR, VARIABLE-SPEED INDUCTION MOTOR

by representing single-phase machines in which the armature reaction is neutralized by a compensating winding *C*. It will be readily seen later that the addition of this winding is indispensable for the operating result desired.

The emf. developed between the brushes in each machine by rotation is in time quadrature with the current passing through the armature, since the exciting current is in time quadrature with the armature current. For a given suitable direction of the excitation winding the emf. between the brushes will therefore have the appearance of an emf. of negative self-induction. Considering the low frequency of the currents due to slip, the narrow air gap and the high peripheral speed which can be attained by the single-phase armatures *A*, it can easily happen that this emf. of negative self-induction will be much higher than the emf. of effective self-induction developed partly in the windings *E*, by the production of the motor field itself, and partly in the winding *C* by leakages. Under those conditions the arrangement as a whole will operate as a negative self-induction. As the currents due to slip are of low frequency, the commutation will not be disturbed. An arrangement such as is represented in Fig. 1 would today be perfectly operative.

USE OF PHASE ADVANCER

However, after the author had shown[2] that an armature provided with a commutator, supplied by polyphase currents, and considered by itself, will have the same effect as a condenser when it is moved at a speed above synchronism in the same direction as the rotating field developed, Mr. Leblanc proposed, as a preferable arrangement, the diagram shown in Fig. 2. The rotor of the induction motor (supposed to be three-phase) is in this case connected through brushes placed 120 deg. apart, with an ordinary armature having a commutator. This armature is moved in the direction of the rotating field developed by the slip currents. It has the same effect as a condenser.

The foregoing apparatus, which is now quite often designated by the term "phase advancer," does not give much better results than those obtainable with the two single-phase machines shown in Fig. 1, however. It merely has the advantage of being simple in construction. On the other hand, it is theoretically subject to greater commutation troubles, because the brushes are to some extent set in the full field. However, it is easy to arrange so that the emf. between the commutator segments which are under the brushes shall be low. The voltage between the brushes corresponds to the voltage between the collector rings of the induction motor, and since the latter is operated nearly at synchronism, the voltage must be quite low. Furthermore, it is easy enough to keep the voltage between the segments from exceeding one volt by increasing the total number of segments of the commutator. In an apparatus of this kind, working at low voltage, the commutator is necessarily large in proportion to the armature.

At the same time that Mr. Leblanc was introducing an armature with an insulated commutator in the rotor of induction motors, he proposed (in the French patent No. 329,154 in 1903) to connect in series with that armature a winding placed on the stator surrounding the armature, in such a way as to develop a "watted" counter-emf. capable of producing a slip. At the same time a real commutator motor, corresponding to the diagram of Fig. 3, was connected in cascade with the rotor of the induction motor.

[2]See *Eclairage Electrique*, Nov. 26, 1901.

COMMUTATOR MOTOR IN CASCADE WITH INDUCTION MOTOR

Subsequently to this invention of Mr. Leblanc, German patents (No. 169,453 in 1905 and No. 179,525 in 1905) were granted to Mr. Kraemer and Mr. Scherbius. These two patents aim to connect in cascade a motor having a commutator with an induction motor. The intention is to make the motor operate at a variable speed by reacting on the commutator motor. In Mr. Kraemer's arrangement the commutator motor is placed on the shaft of the induction motor (see Fig. 4); in the arrangement of Mr. Scherbius a separate set is provided (see Fig. 5). The patents do not contain any special explanation, and the machines utilized appear to be of the ordinary commutator type with either series or shunt winding.

Later the author proposed to place the motor having a commutator on the shaft of the prime mover which supplies power for the induction motor *SR*, when the alternator driven by that power is near the motor *SR*, as, for example, in the case of electric propulsion of vessels.

By placing machines having a commutators inside the rotor of induction motors, Mr. Leblanc sought to improve the power factor, but it will be found that the patents mentioned could not have given him very much information.

This development was further contributed to by the author, who proposed, in the French patent No. 417,190 (1909), to connect an induction motor in cascade with a machine having composite excitation. The machine with composite excitation, which is represented in Fig. 6, is supposed to be self-exciting through its stator. This comprises one winding, c_1, c_2, c_3, which tends to neutralize the reaction of the rotor and a second winding, e_1, e_2, e_3, which is connected in shunt with the machine itself and serves to excite the magnetic field.

The secondary windings of a three-phase transformer, t_1, t_2, t_3, through whose primary windings the rotor currents pass, are connected with the three-phase circuit e_1, e_2, e_3.

In the general case it may be supposed that any one or more phases of the rotor can be made to act by mutual induction on each phase of the excitation winding, e_1, e_2, e_3, for the purpose of obtaining any phase and any value of series emf. in each excitation circuit. The three-phase transformer, t_1, t_2, t_3, may be a rotating-field transformer, in which the connections with the secondary would be made at variable points suitably selected.

CONTROL OF SET

The operation of the set composed of the induction machine and the commutating machine will generally be controlled in the following manner: When running without load, whether the outfit be operating above or below synchronism, the commutator machine develops, by self-excitation from its shunt winding, an emf. at the brushes which corresponds to that induced in the rotor by the slip of the induction machine. Under those con-

ditions it may be assumed that the excitation of the induction machine is supplied either by the supply circuit into the stator or else by the commutator machine into the rotor itself, or again in both ways simultaneously. However, it is the second mode of excitation, obtained by overexciting the commutator machine, that is desirable in order to obtain a high power factor.

When the induction motor is loaded the currents developed in the rotor of the induction machine pass through the commutator machine. Owing to its series excitation, the machine will operate as if it had a certain inductance and a certain resistance, each of which may be either positive or negative. The compensation for the reactance of the rotor of the commutator machine and the series excitation of the field are to be regulated so as to reduce this inductance and so as to give it, preferably, a certain negative value capable of counterbalancing the effect of leakages in the induction machine. Moreover, the effect of the resistance is to be regulated in such a way as to give the induction machine a suitable characteristic. It has been found that, in order to obtain stable operation as a motor, the machine must run below synchronism and must have a positive resistance. In order to work as a motor above synchronism it would be necessary to have negative resistance, and the torque would then increase with the speed.

It is obvious that the series excitation might be obtained, independently of the shunt excitation, by means of distinct windings, but it would always be necessary to make use of series transformers to counterbalance the inevitable mutual induction that would be produced in the stator itself between the series and shunt windings. In the case where the compensation for the rotor reaction is not such that the magnetic flux produced by the rotor is exactly neutralized in the stator there is even mutual induction between the rotor and the compensating winding, on the one hand, and between the rotor and the shunt winding, on the other hand. This it is desirable to neutralize by the series transformer. It will be possible, of course, to arrange a single winding on the stator and to obtain the compensation, even with the shunt winding, by increasing the capacity of the series transformer.

TWO SINGLE-PHASE MACHINES VERSUS ONE POLYPHASE UNIT

The author had proposed previously (patent No. 401,515, in 1908) to use two series single-phase machines with compensated armature reaction and with field regulation, instead of a polyphase machine such as is shown in Fig. 7. In that diagram the normal series excitation is supplemented by an excitation from the opposed rotor phase in such a way as to obtain a high power factor in accordance with the principle of Fig. 1.

It was proposed by others (English patent, Siemens-Schuckert, No. 29,090, in 1909) to use two single-phase machines with shunt excitation, one connected to the terminals of the other. But, in order to obtain real shunt characteristics and a high power factor at the same time, it is necessary, in the author's opinion, to add to that diagram a series transformer t, as represented in Fig. 8. The use of this transformer in separately excited single-phase machines having a commutator forms the subject of the author's German patent No. 11,690 (1906).

In order to obtain a compound characteristic each transformer t should, in addition, allow the self-excitation of each machine by its own current. To this end each transformer t will require a supplementary primary winding for the current of the other machine which it has to excite.

The arrangement of two single-phase machines instead of a single polyphase machine may appear to be merely a complication, but the author does not believe that such is the case. The first arrangement is preferable because more perfect commutation can be obtained at each machine, owing to the fact that there are no brushes set for commutation in the full field, and owing to the use of commutating poles excited by the currents which are out of phase, as in the case of a series motor (see patents of the Oerlikon Company and of the author in 1904). The winding of the commutating pole f of one machine is supplied by the excitation current of the principal field circuit of the other, as shown in Fig. 9. The rubbing surface and the volume of the two commutators of the two single-phase machines might be much smaller than would be the case for the single commutator of the polyphase machine.

INDUCTION OR NON-SYNCHRONOUS MACHINES OF TYPE B

The rotor of an induction machine can be connected with a source of current giving of itself emfs. whose frequency corresponds to the slip. This mode of operation dates back to the American patent of Tesla (No. 390,701, in 1888) and to the German patent of Siemens (No. 109,308, in 1898).

In order to obtain the slip-current frequency use is made of apparatus called phase changers. A phase changer is composed of a continuous-current armature A having collector rings and a commutator like a rotary converter (see Fig. 10). Currents from the supply circuit having a pulsation w are brought to the collector rings by the transformer t. If the frequency changer is operated at the speed w_1 of the rotor of the induction motor, the three-phase emf. developed between the three brushes at 120 deg. from the commutator will have the pulsation $w - w_1$. It is therefore possible to establish a direct relation between the frequency changer and the rotor R. The frequency changer itself can be excited by the stator connected in series or in shunt, as shown in Fig. 11. A detailed description of this frequency changer and of its operation in the form shown is given in the French patent of Mr. Blondel (No. 317,989, in 1902). Mr. Blondel at that time obtained, by utilizing this frequency changer as an exciter, a non-synchronous compound generator and was not specially interested in obtaining speed regulation.

Mr. Blondel gave attention (in French patent No. 317,989) to the operation of the apparatus shown in Fig. 11 as a motor pure and simple. In such a motor it is the movable part receiving current from the supply circuit which plays the rôle of stator S of the induction motor shown in Fig. 10, and it is the stationary part which plays the part of the rotor R of the induction motor supplied by low-frequency currents. It happens that this motor serves by itself as a frequency changer for supplying current to its own rotor. Commutation can never be perfect in such a motor, because there is always an induced emf. between the segments which are

passing under the brushes. But for motors of small power the commutation may be satisfactory enough.

The great advantage of the motor shown in Fig. 11 is that it can be made for variable speed and with shunt characteristics, without any other auxiliary apparatus (see Fig. 12), by simply supplying the windings S_1, S_2, S_3 of the stationary part with variable emfs. taken off the commutator of the movable part. To do this, two brushes are provided for each phase b_1, b'_1, b_2, b'_2, b_3, b'_3 (see French patent No. 43,890, of Allmännä Svenska Elektriska Akiebolaget). It is the commutator of the motor which serves as a speed controller[3].

In the case of Fig. 10 the frequency changer must turn synchronously with the rotor of the induction motor *SR*, whose speed regulation it produces. To that end, if it is not driven mechanically by the shaft of the rotor, it should be driven by a small induction motor whose stator and rotor are connected in parallel with the stator and rotor of the principal induction motor, as shown in Fig. 13. This arrangement was given by the Siemens-Schuckert Company, but perhaps a reference to it can be found in the patent of Mr. Blondel. When current is supplied to the stationary portion of the frequency changer shown in Fig. 11 it can run synchronously with the shaft of the rotor and without the addition of any special motor. (Further reference to this point will be made later.)

It may be easily seen that, for the same commutation and the same peripheral speed of the commutator, the commutator of the frequency changer shown in Fig. 10 must have exactly the size of the commutator that would be required for the rotor of the induction machine in order to produce speed regulation directly. Therefore, to substitute indirect speed regulation by the exciter of Fig. 1 for direct speed regulation, by means of a commutator mounted on the induction machine, seems to be, in a sense, an unsatisfactory solution. It would be different if it were possible to obtain the slip frequency by means of a commutator turning at a natural frequency (number of turns per second multiplied by the number of pairs of poles) lower than that at which the induction machine is running. At the same peripheral speed and for the same emf. at the brushes the emf, between the segments would be lower.

The above-mentioned result was attained by the author in the following manner (French patent No. 436,268):

First Arrangement.—In this case (see Fig. 14) the frequency changer comprises an auxiliary induction machine *A* connected in cascade with a machine *B*, similar to that shown in Fig. 11, and the arrangement resembles the Leblanc-La Cour cascade converter, which is often utilized instead of the usual rotary converters for frequencies of 50 and 60 cycles. If it is assumed that the two machines *A* and *B* have the same number of poles, and that they run with a frequency one-half less than that of the principal induction machine, it will be found that the emfs. generated between the brushes at the commutator have the slip frequency of the principal induction machine, although the commutator is working at one-half the frequency of the induction machine. If it is assumed that the two machines *A* and *B*, running at the same speed, differ in the number of poles in the ratio of one to two, and if it is assumed that the natural frequency of the machine *A* is two-thirds of that of the principal induction machine, it will be found that the emfs. obtained at the commutator always have the slip frequency of the principal induction machine, although the commutator is working at a frequency which is one-third of the frequency corresponding to the speed of rotation of the principal induction machine.

Thus it is possible to make various combinations by which the natural periodicity obtained for the commutator is always less than that of the induction machine. The machine *B* operates as a converter and as a motor at the same time in a proportion which depends on the reduction of frequency obtained at the commutator. This means that, in order to obtain the best results, there should be on the stator a compensating winding having for its object the neutralization of the reaction due to the fact that the machine is working partly as a generator and partly as a motor.

Second Arrangement.—In this case the frequency changer takes the form of a single auxiliary machine (Fig. 15) whose rotor has a commutator having its connections with the armature winding reversed, as shown in Fig. 16. This reversal of commutator connections was devised by Mr. Leblanc in order to obtain a compounding exciter. The reversed connections enable the machine *B* of Fig. 14 to be done away with by placing the commutator directly on machine *A*. They do not constitute so great a complication as might seem to be the case at first glance.

If we assume the induction machine in Fig. 15 to be running at one-half the frequency of the principal induction machine, it will be found that the emfs. obtained between the brushes have the slip frequency of the principal induction machine, although the frequency at the commutator is one-half less than that of the principal induction machine.

If it is assumed that the auxiliary induction machine is running at two-thirds the frequency of the principal induction machine, and that the number of poles of the commutator is one-half that of the winding, it will be found that the emfs. between the brushes always have the frequency of the principal induction machine, although the natural frequency of the commutator is one-third the frequency of the principal induction machine.

Furthermore, if it is assumed that the auxiliary induction machine is running at four-thirds of the frequency of the principal induction machine, and that the number of poles of the commutator is reduced to one-fourth the number of poles of the winding, it will be found that the frequency at the commutator is one-third the frequency of the principal induction machine and so on.

Third Arrangement.—In this case sinusoidal windings are placed on the rotor of the principal induction machine, shown in Fig. 15, just as in the case of the compounding exciter of Mr. Boucherot.

Finally, it is possible to utilize an ordinary frequency changer for exciting a commutator machine having a natural frequency at the commutator which is as low as desired. In that connection the author proposed in 1902 (see German patent No. 154,131) an induction machine excited in the manner shown in Fig. 17.

The exciter or commutator machine comprises a sta-

[3]The idea of obtaining a variable emf. on the commutator of a frequency changer by the use of two sets of brushes with variable distance, was presented in another form by Osmos. (See *Elektrotechnische Zeitschrift*, 1902, pp. 1078 and 1079.)

tionary field, *S*, which is also provided with a commutator. Rotating brushes, moved by the shaft of the induction motor, receive current from the supply circuit and thus produce direct excitation of the commutator machine from the supply circuit. The use of rotating brushes might be avoided by utilizing the apparatus devised by the author (see French patent No. 327,986 of 1902) to which reference is made in the author's paper on compounding (see *Bulletin* of the Société Internationale des Electriciens for May, 1917).

The commutator of the stator of the exciter (Fig. 17) can be replaced by a little special frequency changer, in which case the excitation of the stator is produced by low-frequency currents obtained from the frequency changer. It is possible to utilize this frequency changer, not for exciting one single polyphase machine, but for exciting two single-phase machines. This is shown in Fig. 18. The two single-phase machines in Fig. 18 may have a commutating field, the same as the single-phase machines in Fig. 9. This arrangement of two single-phase machines, instead of one polyphase machine, will be very useful when the speed regulation desired must anticipate high slips. The frequency changer can also be made in inverse form. The emfs. of low frequency are developed between the collector rings, and the emfs. of the normal frequency of the supply circuit are applied to the commutator. This well-known arrangement is represented in Fig. 10. The adoption of the frequency changer in that form amounts practically to the same thing as disconnecting the commutator from the rotor of a motor having a commutator, by the introduction of collector rings, as was shown in the author's patent No. 306,229 of 1902.

The foregoing arrangement is also of interest in the case of large motors with commutators operating at high speed and developing large power per pole. In such cases the voltage between commutator segments is still too high, even when the armature winding has only one turn per commutator segment. Since the width of iron may be lower in the frequency changer than in the motor itself, it follows that a single turn per section of armature winding for the frequency changer will reduce the voltage between segments to a lower value.

As the author has already shown, it will be preferable when delivering current from the supply circuit to the commutator of this frequency changer to increase the number of phases of the currents introduced, as was suggested by him for the case of ordinary commutator machines. If the frequency changer is mounted on the shaft of the induction motor, the collector rings of the frequency changer will no longer be necessary and may be dispensed with. The collector rings of the induction motor may also be dispensed with, and it is possible to imagine a relation between the motor and the frequency changer with a very high number of phases.

Investigation of Heating of Conductors—I

Evidence Indicates that National Electrical Code Rating Should Be Modified to Permit Use of Smaller Conductors Where the Load Is Intermittent—Data on Heating Produced by Continuous Loads

BY HENRY C. HORSTMAN AND VICTOR TOUSLEY

IN THE present national industrial emergency the electrical inspector owes two duties to his nation, namely, to see that installations under his jurisdiction are safe and to see that no more material than is actually required goes into the job. Experimental data gathered by the authors and presented herewith indicate that the National Electrical Code might be made less rigid in the case of conductors carrying intermittent and short-period loads. A more economical use of copper thus appears not only possible as a war measure but also sound engineering practice.

Two factors determine very largely what size the mains shall be for any particular job—heating of the conductors under load and demand factor. Not enough has been known about either of these topics by the average electrical man. The authors of this series of articles have attempted to set down in concise usable form the results of experiments made to determine exactly the heating effects of current on wires under (1) continuous load, (2) intermittent load, and (3) limited time ratings. Demand factors are being studied by the authors with a view to bringing out similarly useful tables on that subject.

The steady current which will produce a given ultimate temperature rise in a conductor can be found by the formula $I = K\sqrt{C}$, in which K is a constant and C the temperature rise above the surrounding air in degrees centigrade. The constants for the various wire sizes here considered are deduced from heating curves experimentally obtained in the laboratory of the Commonwealth Edison Company of Chicago, where the tests were made, at the suggestion of the Department of Gas and Electricity of that city. The constants were obtained by dividing the square of the current used in connection with individual tests by the rise in temperature produced in the conductor. Several sets of constants are given, some of them applying to ultimate temperature rise and others for shorter lengths of time. The tests were made jointly by engineers of the above company and the Bureau of Electrical Inspection.

The method used was as follows: Sections of wire or cable were looped three times through a 10-ft. (3.05-m.) length of conduit pipe. Under these conditions the three conductors within the pipe were heated by the same current. The conduit pipes were supported 2½ ft. (1.06 m.) above the floor by means of wooden horses placed at each end. Thermocouples were placed directly in contact with the copper, with as little disturbance to the insulation as possible, and were installed in the center of the conduit. The current was

furnished by large-capacity, low-voltage storage batteries and was maintained constant by means of adjustable resistance.

A Leeds & Northrup potentiometer indicator was used to determine the difference in temperature of the hot couple on the conductor and the cold couple, the temperature of which was maintained constant at 0 deg. C. by means of a thermos bottle containing ice.

The formula given above is strictly correct only for the ultimate temperatures obtained experimentally, and if other temperatures are to be considered and great accuracy is required, corrections for increased resistance with increased temperature should be made. The errors introduced by failure to make such correction will, however, be small, and for practical purposes negligible. In the accompanying Table I are given the ultimate temperature constants for the various sizes of wire under the heading K. The carrying capacities given are those of the National Electrical Code. In the column "Temperature Rise" are the ultimate temperature elevations attained by the conductors under the test conditions and with the currents given. The temperatures given are also the ones at which calculations made according to the formula will be strictly correct. The column "Time" shows the time in minutes in which the temperature in question is attained. The figures given in connection with 300,000-circ.mil and 400,000-circ.mil cables were not obtained by tests but estimated on the basis of the test on the 500,000-circ.mil cable.

In Table II are the carrying capacities of the various conductors calculated according to the formula given for temperature rises of 10 deg., 20 deg., and 30 deg. C.

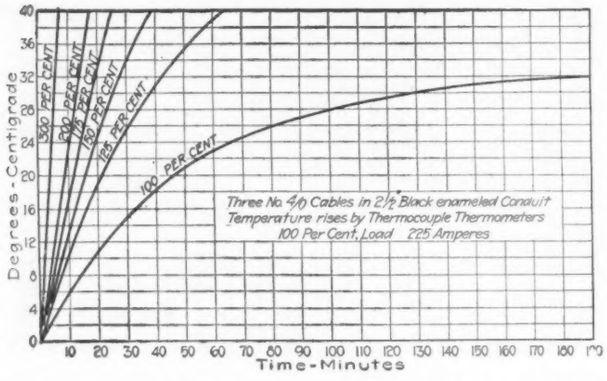


FIG. 1—HEATING OF RUBBER-COVERED CABLES WITH CURRENT
It may be seen that the curves are relatively straight lines during five-minute intervals.

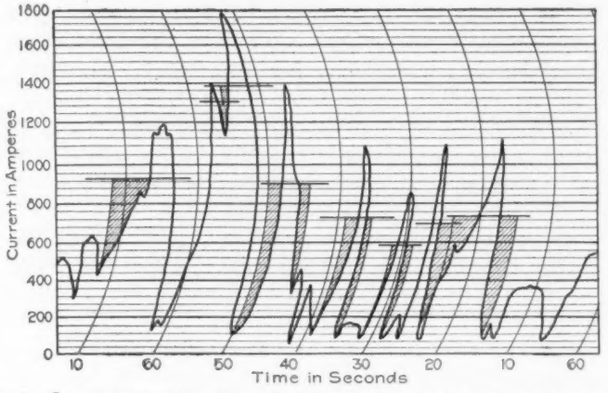


FIG. 2—SIMPLE METHOD OF OBTAINING ROOT-MEAN-SQUARE CURRENT

TABLE I—ULTIMATE-TEMPERATURE CONSTANTS FOR RUBBER-COVERED CONDUCTORS

B. & S. Gage	Carrying Capacity, N.E. Code	In Conduit K	In Conduit Temp. Rise	In Conduit Time, Minutes	Open K	Open Temp. Rise	Open Time, Minutes	Open Temp. Outer Braid
14	15	15	15	80	34	6.5	40	3.6
12	20	23.2	17.2	60	61	6.2	20	4.3
10	25	40.3	15.5	55	88	7.0	30	4.3
8	35	73.8	16.6	85	155	9.5	40	6.0
6	50	136.0	18.4	95	291	8.3	30	6.0
4	70	217.0	22.6	110	442	12.0	35	7.1
3	80	333.0	19.2	100	666	9.6	50	6.6
2	90	422.0	19.2	100	898	9.2	60	6.2
1	100	467.0	21.4	110	1,165	9.2	50	7.2
0	125	684.0	22.8	250	1,768	8.8	50	6.0
00	150	969.0	23.2	150	2,079	11.4	60	6.2
000	175	1,392.0	22.0	200	2,992	9.8	60	8.2
0000	225	1,582.0	32.0	215	3,616	14.0	60	....
300,000	275	2,832.0	26.7	240	5,954	12.7	80	....
400,000	325	3,956.0	26.7	240	8,316	12.7	90	....
500,000	400	5,992.0	26.7	240	12,252	12.7	100	....

TABLE II—CARRYING CAPACITY OF VARIOUS-SIZE RUBBER-COVERED CONDUCTORS

B. & S.	In Conduit 10 Deg. C.	In Conduit 20 Deg. C.	In Conduit 30 Deg. C.	Open 10 Deg. C.	Open 20 Deg. C.	Open 30 Deg. C.
14	12.2	17.3	21.2	18	26	32
12	15.2	21.6	26.4	24	34	42
10	20.7	28.4	35.9	29	45	51
8	27.2	38.3	47.0	39	55	68
6	36.9	52.2	63.9	54	76	93
4	46.6	65.9	80.7	66	94	114
3	57.7	81.6	99.9	81	115	141
2	65.0	91.9	112.0	94	134	164
1	69.1	96.6	114.0	107	151	186
0	82.7	117.0	143.0	133	188	230
00	98.3	139.0	176.0	144	203	249
000	118.0	167.0	204.0	172	244	291
0000	126.0	178.0	218.0	190	268	328
300,000	168.0	238.0	291.0	242	342	422
400,000	198.0	281.0	345.0	288	406	498
500,000	245.0	346.0	424.0	348	490	602

OUTPUT AND WORK OF WOMEN IN INDUSTRY

National Industrial Conference Board Study Covers Manufactures of Electrical Machinery, Apparatus and Supplies

Research Report No. 8 of the National Industrial Conference Board is on "War-Time Employment of Women in the Metal Trades." As published by the board, the data on the output and wages of women cover 127 establishments employing 324,205 men and 47,941 women. Those relating to "Electrical Machinery, Apparatus and Supplies" are published on the opposite page.

In this table the establishments were grouped on the basis of their normal product. In numerous cases establishments were also engaged in the manufacture of munitions. Since, however, the operations on which women were employed are the important consideration, it was considered advisable to use the classification adopted.

A summary comparison of the output of women with that of men on similar work for the electrical establishments is given by the board as printed above.

OUTPUT OF WOMEN

Total Number of Establishments	Greater in all Operations	Greater in Some Operations, Equal in Some	Equal in all Operations	Greater in Some Operations, Less in Some	Equal in Some Operations, Less in Some	Less in all Operations	Not Comparable or Not Stated
18	2	...	6	2	2	2	4

OUTPUT AND WAGES OF WOMEN, ETC.—ELECTRICAL MACHINERY, APPARATUS AND SUPPLIES

Serial Number and Product of Establishment, and Number of Men and Women Employed (*a*)	Number of Women Added or Substituted on Men's Work Since August, 1914 (*b*)	Occupations of Women (*c*)		Wage Rates of Women Compared with Rates of Men so Far as Reported	Abstract of Employer's Statement as to Wages	Abstract of Employer's Statement as to Output
No. 17—Cranes, electrical motors, controllers—425 men, 45 women	8	Drill press, light *Bench work, light* Stock-room attendant		Piece, equal Time, equal		About average.
No. 18—Electrical motors, meters, etc.—2985 men, 665 women	6	*Machines* *Bench work* Winding induction motor stator coils	*Winding* *Taping* *Testing* **Assembling meters**	Piece, some equal, some less Time, less	For assembling of meters women are paid 84 cents per 100 less than men on one type, same pay on other types. For winding induction motor stator coils, pay is same.	Women's output equal to men's on assembling meters; on winding induction motor stator coils, 20 per cent less than men's.
No. 19—Electrical motors—497 men, 108 women	108	Insulating and winding armatures Tool-room attendant Inspecting Assembling, light		Piece, equal Time, equal		Nearly equal.
No. 20—Turbines, electrical generators and motors, electrical apparatus—20,913 men, 2000 women	Very few	*Drill press, light* *Machine taping* *Punch press* *Stamping nameplates* *Winding armatures*	*Winding coils* *Pasting mica* *Assembling, light* *Elevator operator* *Stock-room attendant*			
No. 21—Electrical apparatus and supplies—13,000 men, 1700 women	300	Drill press Grinding Milling machine Punch press Sewing machine *Building up composite insulation* Assembling coils Coil pressing **Winding coils** Coils, form and pull Connecting *Coil insulating* Core building Insulating Stock-room attendant Janitor	Micarta and composition work *Mica splitting* *Taping* Material cutting Riveting Soldering Lamp repairing Assembling Painting Inspecting Packing Weighing Shipping Messenger	Time, less	Piece rates not stated.	Equal
No. 22—Electrical apparatus and supplies—9765 men, 3485 women	282	**Machines, light** Punch press *Winding* *Insulating*	**Motor testing** *Assembling* *Coremaking* Janitor	Piece, equal Time, less	Women's day rates 80 per cent of men's rates.	Comparative figures not available. In some few cases where nimbleness of fingers is main factor indications are that women's output will equal men's.
No. 23—Electrical apparatus and supplies—4700 men, 900 women	138	Drill press Lathe Assembling, light Screw machine Inspecting			Equal pay on all machine operations.	Women's production somewhat below that of good men. This will gradually improve as women acquire experience.
No. 24—Electrical apparatus and supplies—6400 men, 1045 women	Not stated	*Lathe, light* Machines, light Bench work, light Sorting *Inspecting* *Assembling*			Women receive slightly less pay as a rule than men, although margin of difference is gradually decreasing.	
No. 25—Electrical apparatus and supplies—610 men, 190 women	12	Drill press Machines, light Bench work *Assembling*	*Boxing* *Labeling* Drafting *Coremaking*	Time, equal	Piece rates not stated	About the same.
No. 26—Ignition apparatus—530 men, 198 women	25	Drill press Bench work			Women receive less pay than men.	Women's output 80 per cent of men's.
No. 27—Ignition apparatus—1200 men, 900 women	600	Drill press Bench lathe Hand turret lathe	Punch press Riveting machine *Assembling*	Piece, less Time, less	Women's wages about 10 per cent less than men's.	Women show increase of 10 to 15 per cent over men's production.
No. 28—Ignition apparatus—1700 men, 300 women	Not stated	Winding high-tension coils		Piece, less Time, less	Women's rates about 30 per cent less than men's.	Work of women compares favorably.
No. 29—Ignition apparatus—182 men, 368 women	9	Inspecting Elevator operator Messenger			Women inspectors receive about 25 per cent less; men inspectors usually skilled mechanics; girls had no previous experience; elevator operators and errand girls same rates as men.	Practically no difference. Because of special gages, calipers, etc., we have designed, women can handle the work with same speed as men.
No. 30—Ignition apparatus—2020 men, 580 women	Not stated	Grinding machines Turret lathe Inspecting	*Assembling, light* Assembling, all classes Drafting Tool designing	Piece, less Time, less	Women's wages average 20 per cent less, but increase as their efficiency increases.	Production of women in some cases more and in some cases less than men's. In general, on repetitive small work women excel.
No. 31—Gasoline-electrical lighting sets—949 men, 211 women	(Plant established since August, 1914) 211	Machines, light Inspecting Assembling, light		Piece, less Time, less		On some kinds of work women produce more than men, on others less. On repetitive work women's output better.
No. 32—Insulated wires and cables—469 men, 47 women	None	*Braiding* *Spooling*		Time, equal	Women replaced boys and receive wages equal to those of boys, but on weekly basis. No women on piecework.	Not comparable.
No. 33—Molded insulation—189 men, 9 women	9	Inspecting		Piece, equal Time, equal	Work formerly done by boys. Day rate plus bonus in some cases.	Work done by women same in quantity but more accurate.
No. 34—Suction cleaners, motor washers—77 men, 14 women	None	*Assembling, light*			All have day rates—all have some piecework jobs.	

(*a*) Include clerical employees in the majority of establishments. (*b*) Include clerical employees in a few cases, but their number is practically negligible.
(*c*) *Italics* indicate occupations on which women were employed previous to August, 1914. **Boldface** indicates occupations on which women were employed previous to August, 1914, and on which their employment has been subsequently extended; roman type indicates occupations on which women have been newly introduced since August, 1914. Clerical occupations are not designated.

Improving Power Factor and Voltage Regulation

By Using Synchronous Condensers Pennsylvania Company Has Met Increased Demands Without Purchasing Additional Generating Equipment and Has Reduced Transmission Losses

BY J. T. PEYTON
Westinghouse Electric & Manufacturing Company

FOR the last fourteen months the Duquesne Light Company, serving the Pittsburgh district and the counties of Allegheny and Beaver in the southwestern part of Pennsylvania, has had in operation on its lines a 7500-kva., 11,000-volt, 600-r.p.m. synchronous condenser for raising the power factor of the system and maintaining voltage regulation. After this condenser was put in service and its ability to handle the unfavorable conditions imposed on the Rankin plant was successfully demonstrated, the Duquesne Light Company ordered two duplicate machines. One of these was installed during April at the Beaver Falls substation, 32 miles (51.5 km.) from the Brunot's Island plant, and connected by two 66,000-volt transmission lines, each having a capacity of 20,000 kva. This station is at the end of the 66,000-volt system, and the load at that point at the present time is only about 500 kva., so the condenser for the present will be used for controlling the voltage, some method of regulation being necessary on account of the line impedance and the comparatively high reactance of the transformers now in use. The other one, when completed, will be placed in the Lawrenceville substation, where the conditions are somewhat similar. As the company expands and the load on the system increases, it will very likely continue to place synchronous condensers at the principal load centers, and the time may come when it can obtain practically a flat voltage curve notwithstanding variations in the power factor.

BENEFITS OF SYNCHRONOUS CONDENSERS

There is nothing new in the application of synchronous condensers to this class of service, for there are many of them in operation to-day and have been for years. However, when one stops to consider that many of the companies are operating close to maximum rating during these war times, and that generating equipment is necessarily at a premium with a large number of them, it is rather suprising that these machines are not in greater demand. In all probability there are many cases to-day where the conditions are such that the introduction of a condenser would solve the problem, or at least go a long way toward the solution. With the unprecedented increase in prices of apparatus and materials of all kinds, the vital consideration, of course, is the expense incident to any change involving new equipment or construction work. However, a little analysis on the part of the operator who is pressed for sufficient capacity may reveal the fact that by the use of a synchronous condenser he can secure some, if not all, of the following benefits:

1. Meet increased demands without the purchase of additional generating equipment—and by generating equipment is meant not only the generators but the necessary prime movers and auxiliary apparatus.

2. Reduce the cost per kilowatt of additional transmission rating.

3. Effect a material saving in present transmission losses.

4. Improve service by maintaining the required voltage.

Up to 1913 the Rankin plant, now rated at 10,000 kw., was operated independently of the rest of the system. At that time the load had grown to such an extent, owing chiefly to large individual motors and electric furnaces, that it became necessary to parallel with the main generating station at Brunot's Island, where the rating is 115,000 kw. This was done originally through two 11,000-volt lines. The central point of the load was then approximately midway between the two stations so that only about one-half of the line impedance came into the regulation problem, and it was possible to maintain

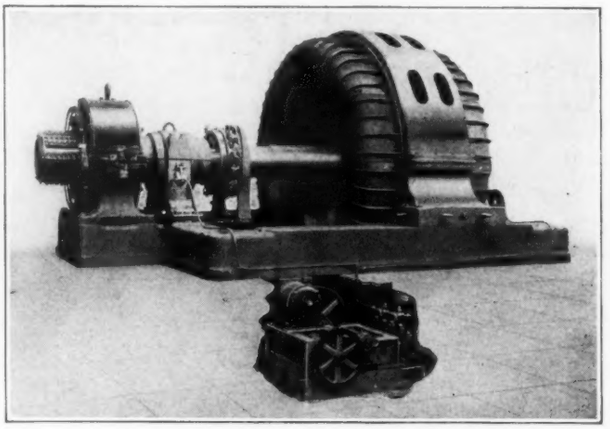


FIG. 1—ONE OF THE SYNCHRONOUS CONDENSERS USED BY THE DUQUESNE LIGHT COMPANY

fairly steady voltage at Rankin. During the last few years, however, the load grew so rapidly that it became necessary to deliver power direct to the Rankin bus for distribution. Two 22,000-volt lines were installed between the stations, having a combined capacity of 16,000 kva. The drop in these lines at full load is approximately 13 per cent. The problem which presented itself was how to obtain the best possible regulation in the 11,000-volt transmission network feeding from the Rankin bus, the load being approximately 10,000 kw. and the power factor ranging from 70 to 75 per cent. (The engine-type generators in the Rankin plant, which have been in service for a number of years, can be operated at low power factor only at reduced capacity.)

To accomplish the desired results at minimum expense, and at the same time provide for probable future increase in load, it was found, in view of the low power

factor, that the installation of a synchronous condenser for corrective effect would actually reduce the transmission investment required per kilowatt, so that a condenser at this point was warranted on basis of transmission rating alone. A 7500-kva. unit was chosen which will permit operating the tie lines, when fully loaded, at a power factor of 90 per cent.

The particularly interesting feature in connection

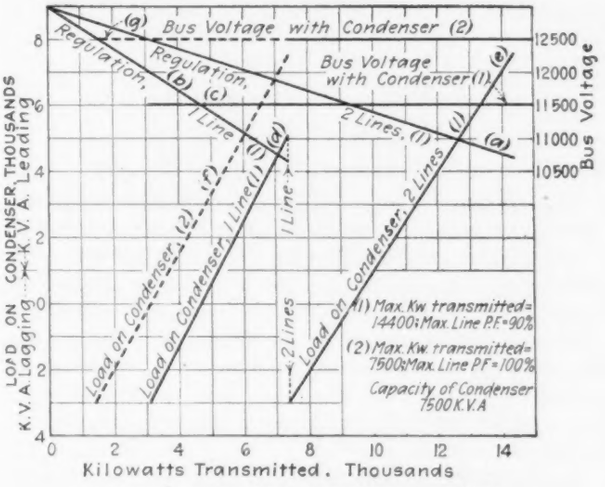


FIG. 2—LOAD AND REGULATION CURVES

with the present method of operation, made possible by the fact that the tie lines are not yet loaded to their rating and that the present load conditions do not require the full rating of the condenser at zero power factor, is the use of this machine as a voltage regulator. The Rankin plant is now run at practically full load with power factor of 90 to 95 per cent, and the voltage regulation of the station is taken care of entirely by an automatic regulator controlling the condenser exciter, it being the only one in the plant. The regulation of the entire network, therefore, is affected automatically by the value of the magnetizing current drawn by the condenser.

The accompanying curves, which were prepared from the transformer and line characteristics, will show the voltage compensation, or regulation, which can be obtained, the line amperes and line power factors, as follows:

(a) Inherent regulation, two lines in parallel, 0 to 16,000 kva., 70 per cent power factor.
(b) Inherent regulation, one line, 0 to 7750 kva., 70 per cent power factor.
(c) Range of constant voltage obtainable when using synchronous condenser from maximum lagging kva. to maximum leading kva.
(d) Synchronous condenser loads, one line in service.
(e) Synchronous condenser loads, two lines in service.
(f) Maximum load transmitted 7500 kw., both lines in service, maximum power factor 100 per cent.
(g) Voltage range corresponding to curve (*f*).

There are several fixed adjustments which can be used to add to the voltage regulation as conditions materially change: (1) The ratio of transformers may be changed; (2) one line or two lines may be used; (3) the old 11,000-volt tie line having approximately 20 per cent regulation can be connected in on exceedingly light loads.

With one line in service and using maximum limits of condenser it will be noted from curves (c) and (d) that the voltage can be maintained constant with load varying from 3100 kw. to 7400 kw. Under load of 7400 kw. the maximum capacity of one line is reached, so at this point the second line is put in service, as shown by the arrows and dotted lines at curves (d) and (e). When the two lines are operated in parallel and using the condenser between its limits, constant voltage is obtained with load varying from 7400 kw. to 14,400 kw., as indicated by curves (c) and (e). With load of 14,400 kw. and condenser operating at maximum capacity leading, the power factor of the line is at its maximum—90 per cent—and the lines are fully loaded at 16,000 kva. When the maximum load is only 7500 kva. and 100 per cent power factor is obtainable, it will be noted that flat voltage range is materially increased, but since the allowable drop is reduced the transformer ratio must be changed.

While the curves show the limits of constant voltage with the condenser in service, it should be noted that it is very undesirable to run the machine at lagging power factor, since it reduces the power factor of the plant, which is already objectionably low. Upon referring to the power-factor curves, especially the one for one line, it will be seen how rapidly the power factor drops when the condenser is drawing lagging current.

While provided with a direct-connected exciter, which was also designed for use as a motor for bringing the machine up to synchronous speed, should this method of starting be desirable at any time, the condenser is self-starting and is equipped with an oil-pressure outfit for raising the shaft up from the bearings in order to eliminate the bearing friction and thereby reduce to a minimum the current required from the line, which otherwise would be comparatively large in amount at the instant of starting. With the oil-pressure outfit in operation the machine can be brought up to synchronous speed without drawing more than 1800 kva. to 2000 kva. from the line, as compared with 7000 kva. required when starting with the bearings dry.

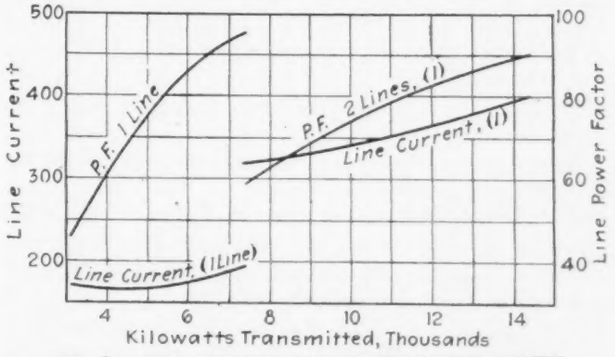


FIG. 3—LINE CURRENT AND POWER-FACTOR CURVES

A pressure in the neighborhood of 100 lb. per sq.in. (7 kg. per sq. cm.) is required actually to lift the rotating part and provide an oil-bearing surface for the journal.

The equipment consists of a motor-driven duplex pump for each bearing and the necessary high-pressure piping. The cylinders are connected in pairs to a common pipe running to each bearing, the oil returning to the pump chamber by an overflow pipe.

INTERCONNECTION FOR POWER INTERCHANGE IN WISCONSIN

Increasing Capacity of System from 5250 Kw. to 17,300 Kw. Without Installation of New Equipment—Rating to Be 24,200 Kw. Later

THE advantages to be derived from the interconnection of electric plants have long been recognized by M. C. Ewing, manager of the Wisconsin Valley Electric Company of Wausau, Wis. In 1911 this company, then the Wausau Street Railway Company, with only a 1650-kw. plant at Wausau, built a 13-mile

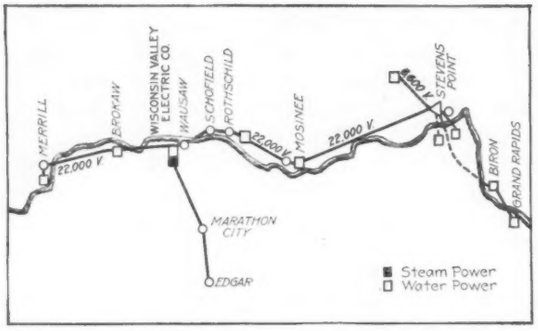


FIG. 1—EXTENT OF INTERCONNECTIONS

(21-km.) transmission line to Mosinee to connect its system with the 3000-kw. plant of the Wausau Sulphite Fiber Company in order to provide for emergency power. A connection was later made with the 2000-kw. plant of the Marathon Paper Mills Company at Rothschild, which is between Wausau and Mosinee. In 1916 the Wisconsin Valley Electric Company purchased the five-wire 125-250-500-volt direct-current (550-kw.) system of the Merrill Railway & Lighting Company at Merrill and built an 18-mile (29-km.) transmission line to connect it with the Wausau system. This line goes through Brokaw, where the plant of the Wausau Paper Mills Company is, and arrangements were made for an interconnection with that plant. When the Stevens Point Lighting Company with a 550-kw. plant was purchased in 1917 by the Wisconsin Valley Electric Company, a 3-mile (5-km.) line was at once built to the plant of the Whiting Plover Paper Company to provide emergency power for the city of Stevens Point. Since then a 25-mile (40-km.) transmission line has been built from Mosinee to Stevens Point.

Arrangements have recently been completed for an interconnection with the system of the Consolidated Water Power & Paper Company, which has paper mills operated by water power at Stevens Point, Biron and Grand Rapids. The Stevens Point plant, which is being enlarged, will have a capacity of 3800 kw., and a line will be built at once from this plant to the substation of the Wisconsin Valley Electric Company in Stevens Point. A 10-mile (16-km.) line will eventually be built from Stevens Point to connect the system with the plants at Biron (600 kw.) and Grand Rapids (1500 kw.), which are now connected by a 5-mile (8-km.) transmission line.

The transmission lines are on wooden poles with bow-arrow arms insulated for 44,000 volts but at present operated at 22,000 volts. Besides the line which connects the various power plants, a branch line 20 miles (32 km.) long has been built west from Wausau to supply light and power to Marathon City and Edgar. This line is three-phase to Marathon City, a distance of 12 miles (19 km.), and single-phase from there to Edgar. The plants of the Wisconsin Valley Electric Company have a combined capacity of 5250 kw., of which 2250 kw. is supplied by the steam plant at Wausau. The water-power plants have the following capacities: Wausau, 1800 kw.; Merrill, 900 kw., and Stevens Point, 300 kw. The capacities of the plants with which connections have been made are as follows:

	Site	Water	Steam
Wausau Paper Mills Company	Brokau	1,000	500
Curtis & Yale Company	Wausau	. . .	500
Marathon Paper Mills Company	Rothschild	2,400	1,000
Wausau Sulphite Fiber Company	Mosinee	3,000	3,500
Whiting Plover Paper Company	Stevens Point	500	650
Total		6,900	6,150

The capacity of the system has thus been increased from 5250 kw. to 17,300 kw. by the present interconnections, and it will be increased to 21,100 kw. when the interconnection with the Stevens Point plant of the Consolidated Water Power & Paper Company is completed this fall. It will ultimately be increased to 24,200 kw. when the transmission line is built from Stevens Point to Biron and the water-power plant of the Wausau Paper Mills Company at Brokaw is changed from direct to alternating current.

The paper mills need large quantities of low-pressure steam for heating in the winter time so a number of the mills are equipped to use the exhaust steam from the turbines for this purpose. This gives them a large quantity of excess power at the time of the year when the Wisconsin Valley Electric Company has its peak load and needs additional energy. This power can be purchased much cheaper than it can be made by the utility.

It is interesting to note that the kilowatt-hour output

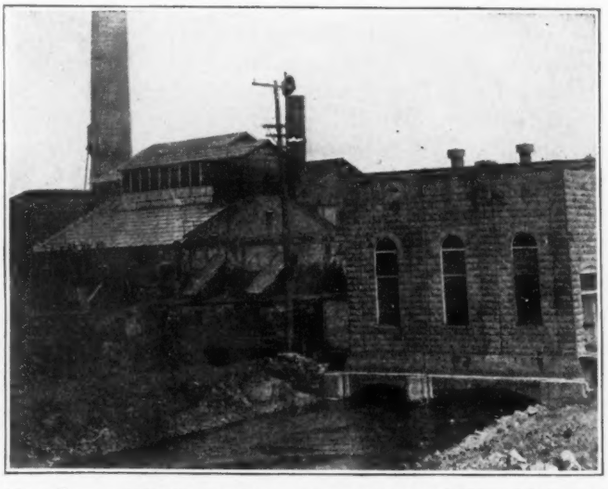


FIG. 2—COMBINED STEAM AND WATER-POWER PLANT AT WAUSAU

of the 300-kw. water-power plant at Stevens Point is at present between two and three times as much as it was before the transmission line was built. The interconnections have made it possible on account of the greater diversity factor to carry increased peak loads and to use the water powers to their fullest extent, thus saving the coal which would ordinarily have been used.

The street railway systems at Merrill and Wausau, with a 5-mile (8-km.) interurban line between Wausau and Rothschild, are also operated by this company.

STATION & OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

PREDICTS BENCHBOARDS FOR USE IN BOILER ROOM

Engineer Foresees Centralized Instruments Indicating and Recording Processes of Combustion in Turbine Room

J. M. Strike, chief engineer of the Acme Power Company, Toledo, Ohio, believes that the very near future will see "the processes of combustion or the entire control of furnaces and boilers centralized in the form of an operator's desk or benchboard. The greater part of the work will be handled automatically. The board will be equipped to bring before the operator a complete operating analysis of conditions existing in the furnaces and boilers." Mr. Strike also expressed the opinion that, no matter how well trained an operator is, he cannot work at his highest efficiency unless he is provided with instruments giving all operating conditions at some central place. Portable instruments are all right in their places, and it is not the intention to discourage their use, for in the average plant great savings can be made with portable instruments. Conditions in most plants, however, change so rapidly that it is impossible to keep accurately in touch with them through the use of portable instruments.

Mr. Strike gave these opinions before a body of station-operating men in Ohio recently.

TREND OF PRACTICE IN OVERHEAD DISTRIBUTION

Standardization of Materials and Use of Larger Transformers Feeding 230-115-Volt Secondaries Recommended

In keeping with the spirit of the times, the transmission and distribution committee of the Ohio Electric Light Association has pointed out that the most important factor in distribution systems is the economical and efficient use of all apparatus and materials. This, it is believed, would lead to a standardization of all materials. Usually a distribution system grows by the addition of transformers and secondaries. Then as the system expands it generally requires complete revision. The most noticeable condition is the great number of small transformers which have been installed. These should be replaced by several large transformers, of which the advantages are enumerated below:

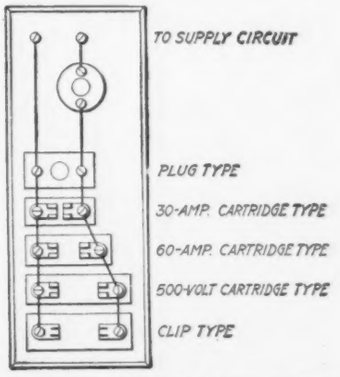
1. The investment in transformers is less because of the smaller cost per kva. of the larger transformer.
2. The core loss is less and therefore the efficiency is greater.
3. The number of lightning arresters is reduced.
4. The transformer capacity might be reduced because of the greater diversity of load which occurs with the larger number of consumers supplied from a single transformer.
5. Transformers should be installed about 1700 ft. (518 m.) apart in residence sections to insure the economical use of a distribution system.

The secondary system should be rebuilt, using three-wire 230-volt circuits for all street mains. Great care must be exercised to provide a balanced condition of the load. The neutral wire in a balanced system may be two sizes smaller than the outside wires. The voltage drop of a balanced three-wire system is one-fourth that of a two-wire system, other conditions remaining the same in both systems.

ANOTHER SIMPLE PANEL FOR THE TESTING OF FUSES

May Be Used in Industrial and Central-Station Plants for Testing Various Types of Fuse—Lamp Indicates Whether Fuse Is Good

The method of testing fuses in use at New Haven (Conn.), as described on page 983 of the May 11 issue of the ELECTRICAL WORLD, may be extended to test other sizes and types of fuses by the addition of more



FUSE-TESTING PANEL FOR DIFFERENT SIZES

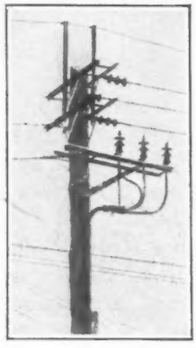
fuse blocks. The accompanying sketch shows the method of connecting five fuse blocks. As will be noted, both sides of the fuse blocks are connected in multiple. One side is connected directly to the supply line, while the other side is connected to the line in series through a 10-watt lamp. The placing of a good fuse in any fuse block will light the lamp.

The use of this test panel may also be extended to the testing of fuses in industrial and central-station plants as well as the testing of fuses as they are sold to consumers. One of these panels permanently mounted at a convenient place near the switchboard and equipped to take the type of fuses in use on the board, including instrument transformer and special fuses, will prove a great convenience in locating trouble.

OPEN-WIRE CONNECTION TO UNDERGROUND DUCT

Terminus of Cable Brought Out in Three Single-Conductor Potheads Held on Metal Cross-Arm—Easily Accessible

Simplicity of construction and accessibility are the features of an open-wire termination for an underground duct on a 26,400-volt transmission line of the Public Service Company of New Jersey. As shown in the photograph produced herewith, the cross-arm supporting the potheads is fastened to the pole so that it is parallel to the open-wire line. The terminal of the open-wire line is made by three strain insulators attached to the ordinary pole cross-arms. The arrangement of the potheads allows a conductor from the underground cable to be connected to any conductor of the overhead line without the danger of short-circuiting it.



CONCRETE MAY REPLACE STEEL IN POWER-HOUSE CONSTRUCTION

Air Ducts and Breechings for Which It Is Almost Impossible to Get Steel Plates Can Be Constructed of Substitutes

A central-station engineer in the Middle West, desiring to bring out discussion through the ELECTRICAL WORLD of reinforced-concrete air intakes for turbines and reinforced-concrete breechings for boilers, offers the following as his first experience with construction of this type:

"In constructing a boiler room to serve a 25,000-kw. addition to the station the breeching, according to the original design, was to be of steel. Just at the time when the station was nearing the state of completion where it would be ready to go into operation it was found that deliveries on the steel plates for the breechings were a long time further in the future than had been expected. As a possible solution of this difficulty it appeared that the situation might be saved by installing a reinforced-concrete breeching. Calculations were at once started to see whether the loading that would be imposed on the remainder of the structure by the heavier concrete breeching could be tolerated. This analysis developed the fact that the shearing stresses in some of the steel-frame members which the extra weight would impose were not within a safe limit. The concrete type of construction was therefore abandoned. Had the idea of using concrete come to light sooner so that the general building design could have been made more liberal the cement breeching would have been used. No difficulties were foreseen from heat or from expansion which could not be easily overcome by patented asbestos lining and by sliding expansion joints. It appeared from the calculations that the concrete construction would have been cheaper than the steel, even though part of the structural steel for the building would have been heavier.

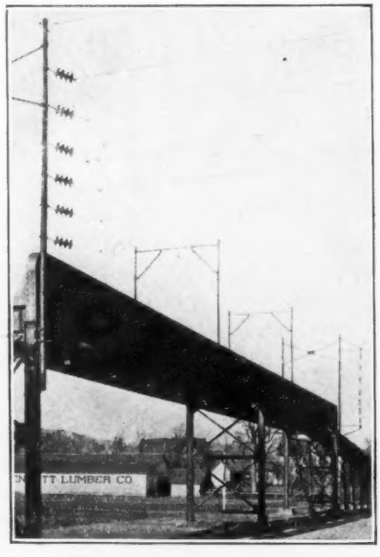
"At about the same time it became apparent that there would be delay in getting the air intakes for the turbine installed. These were to have been of steel. It also happened that the section of concrete floor under which these ducts were to be placed had not been laid. A design for reinforced-concrete ducts was worked out, and these ducts have been installed. They are suspended under the steel beams which support the concrete power-house floor."

INEXPENSIVE OVERHEAD LINE CROSSING AT RAILROAD

Six High-Tension Wires in Vertical Plane Are Supported by Strain Insulators Attached to Overhead Bridge

Two three-phase transmission circuits of the Fort Smith (Ark.) Light & Traction Company have been strung across a railroad right-of-way on supports attached to an overhead bridge. This type of construction was chosen in order to avoid the use of extra-high poles and to make a permanent job. The arrangement, as worked out, proved inexpensive.

At each end of the main bridge span tubular steel trolley poles were attached to upright members of the steel bridge by means of three large U-bolts. These steel poles were also braced at the top by guy wires and by an angle-iron framework which supported the trolley wire over the track. The fact that the high-tension circuits ran parallel to the track on one side of the railroad and at right angles to it on the other made different types of construction necessary at each support. The two types of construction employed are well illustrated in the picture herewith. On one side strain insulators and short "pull-off" wires served to support the wires at this right-angle turn and to give



TWO THREE-PHASE CIRCUITS SUPPORTED BY STRUCTURES AT EACH SIDE OF CROSSING

ample clearance between the circuits and the steel bridge span. On the other side of the bridge seven strain insulators hung in a continuous string are supported between angle-iron mast arms attached to the trolley pole. The high-tension wires are then supported at the points between the strings of insulators.

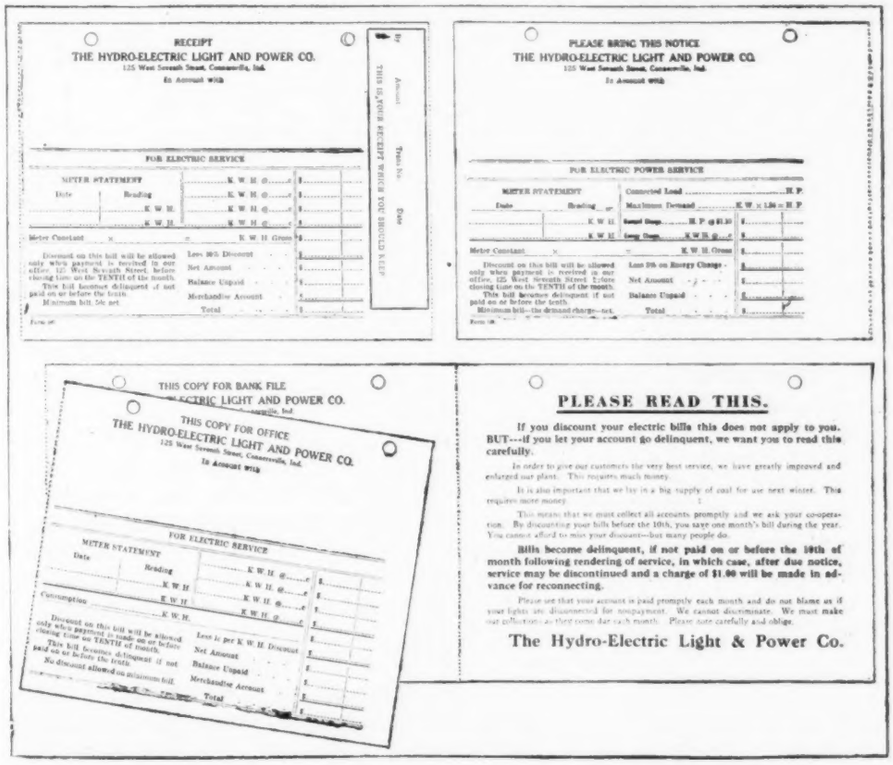
CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

A BILLING PLAN THAT HASTENS COLLECTIONS

Meter Readers Make Out Bills and Leave Them with Customers—Plan Is Inexpensive and by Its Use Bills Reach Customers Promptly

The Hydro-Electric Light & Power Company of Connersville, Ind., has a billing system by which the men who do the meter reading at the same time make out the bills and leave them on the consumers' premises. The company supplies electric light and power service as well as gas in Connersville, which has a population


RECEIPT
THE HYDRO-ELECTRIC LIGHT AND POWER CO.
FOR ELECTRIC SERVICE
METER STATEMENT
PLEASE BRING THIS NOTICE
THE HYDRO-ELECTRIC LIGHT AND POWER CO.
FOR ELECTRIC POWER SERVICE
METER STATEMENT
THIS COPY FOR BANK FILE
THIS COPY FOR OFFICE
THE HYDRO-ELECTRIC LIGHT AND POWER CO.
FOR ELECTRIC SERVICE
METER STATEMENT
PLEASE READ THIS.
If you discount your electric bills this does not apply to you. BUT—if you let your account go delinquent, we want you to read this carefully.
Bills become delinquent, if not paid on or before the 10th of month following rendering of service, in which case, after due notice, service may be discontinued and a charge of $1.00 will be made in advance for reconnecting.
The Hydro-Electric Light & Power Co.

THE THREE BILL FORMS USED BY INDIANA CENTRAL-STATION COMPANY

of 8000, and also supplies electric service to several small towns near by. The general form of bills is the same for each class of service, namely, electric light, electric power, electric service in nearby towns, and gas. The bills differ somewhat, however, in detail. The three types of electric bills, which the company designates as forms Nos. 107, 108 and 109, are shown herewith. Form No. 107 is the regular lighting bill, form No. 108 is the regular power bill, and form No. 109 is the bill which is used for small towns where collections are made through the banks. The system as it applies to form No. 107 is as follows:

The bills are made in triplicate and are perforated for easy detachment. An addressograph is used to fill in the name, address and date. The last readings and any balances are then put on. The meter readers aim to read 100 bills each half day and have ring binders which will take care of that number of bills. As they read a meter they make out the bill and leave the third copy, bringing back to the office the copies marked "File" and "Receipt." Postings are then made, and the bills are distributed in an office rack for payment.

When payment is made the customer is supposed to bring with him the third copy. This gives the account number, which is also put on by the addressograph along with the name, etc. This plan facilitates the locating of the original bill, but, of course, is not absolutely necessary. The company's cash register prints the receipt on the right end of the customer's copy, showing who receives the payment, the account it goes to, the amount, the transaction number and the date. The same information is also shown on the margin of the company's own copy, which is filed for future reference.

The same system applies to the power and gas bills, but the form No. 109 used in small towns is slightly different. The difference is that the customer brings back his notice to be receipted, whereas for the city customer the second office copy is receipted. In the small town meter readers leave one notice at the house, a second notice at the bank and bring back the first copy to the office.

In response to a query about the cost of operating this system, Erle G. Weeks, treasurer of the company, said: "I have no absolute costs, but our men can read 200 meters a day. This gives an idea of what the cost would be. We consider that the expense of getting the bills ready would be no more than that of any other form of billing.

"There are several very distinct advantages in the use of these bills. First is the saving of postage. Second is the fact that the customer can come in and pay his bill just as soon as the meter is read. There are many cases where the customer comes into the office

to pay his bill before the meter reader returns after the half day, and since the customer has his own copy of the bill we take his money and get the benefit of the use of it. During these days of close figuring we feel that this early collection is worth something.

"Then, again, we have the use of the advertising on the back of the bills. This is not a big expense, and the announcements go to every customer, giving us an opportunity of pushing a special item each month. The copies shown, however, can hardly be said to carry an advertisement. We wanted to urge prompt payment."

DAYTON LIGHTING UTILITY SELLS STOCK LOCALLY

Company's Own Organization Without Outside Aid Is Employed to Dispose of $56,000 Par Value of 6 per Cent Cumulative Preferred Stock

A stock-selling campaign in its home territory just completed by the Dayton (Ohio) Power & Light Company was somewhat unusual in that it was handled by the company's own men exclusively. The major portion of the work was carried by the commercial department under the direction of Thomas F. Kelly, commercial manager. The issue consisted of 560 shares of $100 par value authorized for sale by the Ohio Public Utilities Commission at $85 per share. The plan was to sell not more than twenty shares or less than one share to any person. At the end of three weeks 387 shares had been sold, and the entire campaign was completed in less than five weeks.

The issue, being comparatively small, was sold without any really intensive sales effort. Some newspaper advertising in Dayton and in other towns served by the company was used. The advertisement published with this article is typical, the slogan in the literature being "It's a mighty good buy." As further producers of inquiries personal letters were employed, and local bankers in the smaller towns were personally told of the issue in order that they might suggest it to prospective investors asking advice. An interesting feature of the publicity campaign was that the first stock purchaser was the printer who was employed to get out the literature. Proofreading the copy convinced him that he should voluntarily subscribe to the issue to the full amount of his savings.

An Investment Opportunity
In One of Your Public Utility Properties

An opportunity is now available to our customers to become financially interested in this large public utility system—to share in the moderate returns following efficient, progressive and economical management and full consideration for the rights of the public.

The Dayton Power & Light Company is now operating in Montgomery, Greene, Clark, Clinton and Miami counties and supplying electric service in forty-one communities including the cities of Dayton, Piqua, Xenia and Wilmington. In addition we supply Steam Service in Dayton, Heating Service in Piqua and own and operate the Waterworks system of Wilmington.

We desire to encourage increasing proprietorship in the company by all customers. There are at present more than 1200 widely-scattered stockholders.

Among the many reasons commending the purchase of the 6% Cumulative Preferred Stock of the Dayton Power & Light Company now are the following:

We will sell a $100.00 share for $85.00 in cash or in monthly payments and you will earn 7% on your investment.

Each share can be purchased by paying $10.00 down and the balance in five payments of $15.00 each.

Business and gross earnings have steadily and substantially increased since organization in 1911.

This stock has paid quarterly dividends of 6% per annum regularly since the organization of the company.

The company is a large organization with annual gross earnings in excess of $2,000,000 and with properties located in diversified communities.

The company publishes an annual report which is accompanied by certificate of audit by an independent auditor.

Dividends on three or more shares will return to you enough to pay the average residential light bill for a year.

Your capital and the money it earns for you will remain at home.

FROM ONE TO TWENTY SHARES MAY BE PURCHASED FOR CASH OR MONTHLY PAYMENTS. THE SMALL STOCKHOLDER IS WELCOMED AND PURCHASERS OF ONE SHARE WILL RECEIVE THE SAME CONSIDERATION AS THE PURCHASER OF THE MAXIMUM NUMBER. DETAILED INFORMATION UPON REQUEST.

"It's a mighty good buy"

The Dayton Power & Light Co.
50 South Jefferson Street
Bell, Main 4494 Home 6166

INTERESTING THE LOCAL PUBLIC IN UTILITY STOCK

THE DAYTON POWER & LIGHT COMPANY
Home Telephone Building, 50 South Jefferson Street
DAYTON, OHIO

July 15, 1918...

TO OUR CUSTOMERS:

The Public Utilities Commission of Ohio has authorized a limited issue of the company's 6 per cent cumulative preferred stock, the proceeds of which are to be used for additions to our property.

We have felt that a large number of our customers would be glad to avail themselves of an opportunity to invest their savings and thus become partners and part owners in this local enterprise, and therefore, for the first time, we are offering our stock to our customers under the following arrangements:

Each customer will be permitted to buy from one to twenty shares of this preferred stock at $85 per share (par value $100 each). Payments may be made in cash or on the following installment plan:

Ten dollars a share to be paid at the time of subscription and fifteen dollars a share per month to be paid at the time the bill for electric service is due, until the full amount of the subscription has been paid, which shall include the accrued dividend from the last preceding dividend date.

Interest at 5 per cent per annum will be allowed on all payments until the final payment is made, when the investment will begin to earn 6 per cent.

The purchase of this stock at $85 a share means that you will earn over 7 per cent on the money invested, and in addition this stock is tax-free in Ohio.

Your subscription will be received at our office or our representative will call at your convenience. Dividends on three or four shares will return to you each year enough to pay the average residential light bill for a year. The fullest investigation of this offering is desired.

Yours very truly,
THE DAYTON POWER & LIGHT COMPANY,
THOMAS T. KELLY, Commercial Manager.

A LETTER TO THE CENTRAL STATION'S CUSTOMERS

Any union rule or workmen's agreement to limit the output in shipyards should be treated as criminal at this time. Pershing's men are not limiting their output. They don't limit the blood they shed or the efforts they expend, and shame and disgrace should be the portion of any man who here at home limits the output necessary to make the blood and the labor of our soldiers at the front of avail.—*Col. Theodore Roosevelt.*

TECHNICAL THEORY & PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Calculation of Commutators of Alternating-Current Machines. — M. SCHENKEL. — General formulas are given for calculating the commutators of any type of alternating-current commutator machines. The dimensions of the commutators and particulars of the brush gear are fixed in relation to quantities that are only to a small extent in the control of the designer. It is important to note that the required dimensions are almost rigidly fixed. The application of the formulas is illustrated by the insertion of average values.—London *Electrician*, July 14, 1918.

Running-Down Methods of Determining Losses of Machines.—In obtaining the running-down curves of small machines difficulty is sometimes experienced owing to the shortness of the time taken to come to rest. Two methods are given to meet this difficulty. In one the machine is allowed to run down from a series of different speeds, the length of time taken in each case being measured by a stop watch. In this manner a number of parallel portions of the whole running-down curve are obtained which can easily be pieced together by shifting them horizontally until the times corresponding to stand-still coincide.—*Science Abstracts, Section B*, June 29, 1918. (Abstracted from *Schweiz. Elektrot. Verein*, March, 1918.)

Circle Diagram of the Induction Motor.—The Heyland circle diagram of the induction motor is more commonly used than the more accurate Ossanna circle diagram. The reason for this lies in the difficulty of following out the repeated inversions associated with the latter method. In the present article it is shown how it is possible to obtain the Ossanna circle with a single inversion, and it is expected that this simplification will favor the more extensive use of the Ossanna circle.—*Science Abstracts, Section B*, June 29, 1918. (Abstracted from *Elekt. Zeits.*, Jan. 31, 1918.)

Generation, Transmission and Distribution

Value of Making Brick Settings Air-Tight.—Economies which have resulted from making brick settings air-tight are cited. The article also discusses the cause of low flue-gas temperatures, the results of tests and the prevention of air leakage.—*Journal of American Society of Mechanical Engineers*, July, 1918.

Report of Bureau of Engineering, Public Service Commission of Pennsylvania.—This report contains: (1) A description of the organization and administration of the Public Service Commission; (2) the administration and special work in connection with service rules and standardization laboratories; (3) investigation of formal and informal complaints; (4) investigation of highway-crossing applications; (5) specification covering construction of crossings of overhead lines of public utilities; (6) uniform service rules for water utilities, and (7) other reports of special interest.—*Second Annual Report*, for year ended June 30, 1918.

Utilization of Anthracite Waste.—This article discusses the burning of anthracite slack or culm and the performance obtained when they are mixed with soft coal in various proportions. Consumption of anthracite at the mines, burning anthracite in suspension, culm production in tons, mixtures of soft coal and culm, producing steam with mixed fuels, effect of size of coal combustion, bituminous firing, thickness of fire, handling frozen coal of fine grades, storage of anthracite coal, firing of anthracite buckwheats and anthracite and soft coal mixed, and briquetting of anthracite waste are also considered.—*Journal of American Society of Mechanical Engineers*, July, 1918.

Improvements in Electric Power Work in France.—Attention is called to the great increase in the use of water power in France since 1914, principally for the manufacture of large-caliber shells and armorplate. It is said that the development of three rivers in the vicinity of the Alps has been carried to the extent of 180,500 hp. These new factories will, after peace is signed, be called upon to play a considerable rôle in the economic struggle of the future. They will enable France to become a larger producer of matter and materials for which Germany had formerly almost exclusively held the monopoly in manufacture, such as chlorine, bromine, magnesium and products required in the dyeing industries.—*American Chamber of Commerce in Paris*, May 15, 1918.

Addition to Formulas for Calculation of Mutual and Self-Inductance.—FREDERICK W. GLOVER.—The subject includes (1) mutual inductance of parallel coaxial circles, (2) mutual inductance of parallel eccentric circles, (3) self-inductance of a single-layer coil or solenoid, (4) self-inductance of a circular coil of rectangular cross-section, (5) self and mutual inductance of linear conductors. Some of the formulas given, notably those for eccentrically placed circles, provide a solution for cases where none has been previously available. Others are extensions of formulas already well known or cover cases where earlier useful expressions are available. This paper is now ready for distribution.—*Scientific Paper No. 320*, Bureau of Standards.

Power Factor and Its Improvement.—E. W. DOREY.—The author discusses the causes of low power factor and the question of whether the cost of its improvement should be borne by the consumer or by the supply company. A special tariff is suggested for the power consumer as an inducement for him to pay for this improvement. The means available for improving the power factor are considered, and examples are submitted showing the economic results obtained. Prac-

tical suggestions cover the field of operation of rotary converters and synchronous motors, and static condensers are considered.—London *Electrician*, May 31, 1918.

Static Condensers.—W. B. TAYLOR.—Unity power factor on a transmission system is a condition much to be desired, but one which is seldom realized except on direct-current circuits. Low power factors entail heavy idle currents, which increase heating and line losses and disturb voltage regulation. Wherever possible some means should be employed to correct this condition, the usual method being the installation of synchronous condensers. These machines, however, are relatively expensive and require the services of an attendant, and in some instances the cost of installation and maintenance is not justified. The static condenser offers a solution of the problem in many cases. This article shows the improvement in service that may be effected by the use of static condensers on circuits of low power factor and compares this improvement with that afforded by installing additional feeder copper. —*General Electric Review*, August, 1918.

Water Power Developed in British Empire.—In this paper the progress of hydroelectric development is shown in Canada, Australia, New Zealand, Africa and India.—*Times Engineering Supplement*, July, 1918.

Traction

The Dynamics of Wheel and Track.—The author investigates theoretically and experimentally the laws of motion of a wheel rolling or sliding down an inclined plane. In order to eliminate any appreciable effect of air friction, etc., the wheel is made heavy (107 kg.) and its form is designed to give high inertia, so that the acceleration is reduced and with it the difficulty and danger of measuring the speed of the heavy wheel. The latter is turned down to form a relatively small-diameter axle on each side, and the bearing pressure on the track is high, so as to imitate railway conditions. —*Science Abstracts, Section B*, June 29, 1918. (Abstracted from *Vereines*, March 30, 1918.)

Installations, Systems and Appliances

Opportunity of Electrical Refrigeration.—H. N. SESSIONS.—The author suggests the possibilities of electrical refrigeration as one of the most extensive summer loads at the present time, with enormous opportunities for the future. The Southern California Edison Company is supplying electricity to one ice company alone, using approximately 200 hp. in motors to manufacture raw-water ice in connection with cold storage. Several of the large electrically operated ice plants show an average consumption for the year of less than 15 kw.-hr. per ton. The usual motor installation of an ice plant, including all auxiliaries, is approximately 3 hp. per ton of ice to be made each twenty-four hours. The average ice-plant load is one with an annual load factor above 80 per cent, a monthly load factor of 90 per cent, and by using synchronous motors the power factor may be kept close to unity. Advantages in the use of electricity in ice plants are that less labor is required for operating and that the fire hazard is also reduced. Owing to the fact that higher speed, and thus cheaper compressing machinery, may be used with electric drive, electricity is fast supplanting steam in this service.—*Journal of Electricity*, Aug. 1, 1918.

Industrial Controllers.—XIX.—H. D. JAMES.—In the production of coke, control apparatus for the crushing and conveying machines should be especially protected from coal dust and "coke breeze." Many controllers are inclosed in cabinets and provided with felt packing around the door. Alternating-current motors are preferable for all conveyors, crushers, damper regulators and screens. These motors have fewer moving parts than a direct-current motor and are less likely to be affected by the dust. Direct-current motors are preferable for traction purposes, also for the pusher, leveler and door machine, and for the unloading machines (either car-dumping type or hoisting type). All of the motors and controllers in a coke plant are subject to a great deal of dust and to fumes.—*Electric Journal*, July, 1918.

Electrophysics and Magnetism

Skin Effect in Tubular and Flat Conductors.—H. B. DWIGHT.—A method is presented for calculating the skin-effect resistance ratio of a tube, which is a form of conductor to be recommended for high-frequency work. A formula is also developed by means of which the asymptote to the curve of the ratio R'/R may be drawn, and thus the magnitude of the skin effect at extremely high frequencies may be obtained. The values of the ratio R'/R for tubes of various thicknesses are plotted in a set of curves which may be used for the solution of practical problems. A similar method is described for the calculation of skin effect in a thin strap. Although the calculations cannot be carried out for as high frequencies as the calculations for tube, a method of coördinating the test results for straps has been published. A set of empirical curves for straps is given from which approximate values of R'/R for any case may be read.—*Proceedings A. I. E. E.*, August, 1918.

High-Tension Direct Current from Alternating-Current Supply.—The author describes the arrangement and characteristics of an equipment by which a direct current of about 0.01 amp. at 10,000 volts is obtainable from alternating-current supply. The direct-current pressure is practically constant within a wide range of load.—*Science Abstracts Section B*, June 29, 1918. (Abstracted from *Schweiz. Elelctrot. Verein*, April, 1918.)

Radiation Efficiencies of Light Sources.—Describes the filter employed in conjunction with a thermopile to give the latter the same sensitivity curve as that of the normal eye. By means of this filter the light efficiencies of various sources are compared.—*Science Abstracts, Section A*, June 29, 1918. (Abstracted from *Ann. d. Physik.*, March 11, 1918.)

Distribution of Radioactive Gases in the Open Air.—A theoretical treatment based on the laws of diffusion. Formulas are obtained for the distribution of the various radioactive gases (radium, thorium and actinium emanations) in the atmosphere with respect to distance from the surface of the earth.—*Science Abstracts, Section A*, June 29, 1918. (Abstracted from *Phys. Zeits.*, March 15, 1918).

Electrochemistry and Batteries

Methods and Plant for Battery Charging.—F. AYTON. -The author deals with the present bearing which

charging operations have upon the satisfactory working of the electric vehicle, and the different methods invoked for the charging of both lead plate and nickel-iron-alkali batteries. He also describes suitable charging plant and arrangements.—London *Electric Vehicle*, June, 1918.

Units, Measurements and Instruments

New Stellar Photometer.—Light from an artificial source is reflected from a small silvered portion of a glass plate inserted at 45 deg. in the path of the rays from an object glass to the eyepiece. The focus is adjusted so as to give an out-of-focus image, in the center of which will be seen the illuminated silver disk. Adjustments are then made so that the artificial light is just invisible on the starlight. Difficulties owing to the differences of color of starlight and artificial comparison are remedied by interposing colored screens.—*Science Abstracts, Section A*, June 29, 1918. (Abstracted from *Comptes Rendus*, Feb. 18, 1918.)

Reflection of Surfaces with Negative Curvature.—Describes in detail the image formation in the case of mirrors similar to a napkin ring smaller in diameter at the middle, a section of the ring by a plane passing through the axis consisting of segments of two circles whose centers lie outside the ring. The surface considered, in fact, is generated by the revolution of a segment of a circle about a line in its plane lying altogether outside the circle and parallel to the tangent at the middle point of the segment.—*Science Abstracts, Section A*, June 29, 1918. (Abstracted from *Phys. Zeits.*, March 15, 1918.)

Instruments for Central-Station Switchboards.—G. W. STUBBINGS.—It is stated that ammeters or indicating wattmeters are required only to give the load on a machine or in a feeder approximately correctly and, therefore, do not need to be of the highest accuracy. Voltmeters, as a rule, are required to give accurate indication, and with them a higher class of construction is desirable. Integrating wattmeters give the final result of the conversion of the potential energy of the coal into electrical energy. If the efficiency of this conversion is to be known with certainty, and if it is desired to keep the performance of the generating sets under close supervision, the accuracy of these meters should be the highest possible, and such accuracy, apart from mechanical failure, should be maintained for an indefinite time.—London *Electrical Review*, June 14, 1918.

Telegraphy, Telephony and Signals

Closed-Circuit Translation Arrangement for Hughes Typewriter.—The author points out that uniform signaling conditions are necessary to secure satisfactory working on Hughes circuits. This is best secured by suitable earthing periods after each signal is sent to line. In cases of direct communications between corresponding stations this may be easily arranged for. If, however, the line is so long that an automatic repeater (translator) is necessary, earthing arrangements must be provided there. In the Austrian Telegraph Administration the d'Arlincourt translator has been used hitherto, but this is complicated and requires six relays. The author reduces the number of relays to two by adopting a special construction.—*Science Abstracts, Section B*, June 29, 1918. (Abstracted from *Elektrot. u Masch.*, April, 1918).

Audibility Current of a Telephone Receiver.—Describes a method of determining the audibility current of a telephone receiver, using a Wheatstone bridge, the arms of which must be practically free from both inductance and capacity. Film resistances serve very well for this purpose.—*Science Abstracts, Section B*, June 29, 1918. (Abstracted from *Inst. Radio Eng.*, April, 1918.)

Oscillating Audion Circuits.—The purpose of this paper is to explain the general principles upon which depend the uses of the audion for generating electrical oscillations by "regenerative action" and to discuss in detail the action in certain circuits.—*Science Abstracts, Section B*, June 29, 1918. (Abstracted from *Inst. Radio Eng.*, April, 1918.)

Miscellaneous

British Engineering in Spain.—Following up several recent references to the need for British manufacturers to make special efforts to secure a hold upon the Spanish market for engineering and electrical equipment and apparatus, attention is called to an interesting pamphlet bearing the title "Things for British Engineers," which was issued some time ago by the British Engineers' Association, 32 Victoria Street, Southwest. It is written by a British engineer who was in Spain for some years handling British machinery. He makes a number of suggestions based upon his practical experience gained in touch with the principal buyers both official and commercial.—London *Electrical Review*, July 19, 1918.

Exporting Electricity.—International supply of electric energy is already adopted in one or two places, a notable example being the transmission of electricity from a west Swedish hydroelectric power station by means of a partly submarine cable to the Danish Island of Zeeland. This supply has been in operation a couple of years and has worked satisfactorily.—*Times Engineering Supplement*, July, 1918.

The Quick Determination of Incombustible Matter in Coal and Rock-Dust Mixtures in Mines.—A. C. FIELDNER, W. A. SELVIG and F. D. OSGOOD.—The volumeter method consists in using a specific gravity flask with a graduated stem so proportioned that the volume of a definite quantity of dust suspended in exactly 50 cu.cm. of alcohol can be measured by reading the meniscus of the alcohol on the graduated stem and referring to a calibration table. The method of operating the Taffenel volumeter is explained.—*Technical Paper No. 144*, Bureau of Mines.

Weights of Various Coals.—S. B. FLAGG.—This paper reports the investigation of changes in weight of volume when subjected to wetting and shaking of numerous kinds of coal, the results of which are embodied in useful statistical tables. Conclusions arrived at are that, of two samples of any coal that are composed of the same proportions of pieces of different sizes, the sample having the higher moisture content will usually weigh the more per cubic foot and that heavier weights may be expected for coals of high fixed carbon content than those of low. Increased ash content seems to lower the unit weight, and the younger coals are lighter than the older coals.—*Technical Paper 184*, Bureau of Mines.

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

IRON AND STEEL ELECTRICAL ENGINEERS AT BALTIMORE

Problem of Training and Conserving Man Power to Get Quantity Production—D. M. Petty Elected President

A vital necessity in the conduct of the war is quantity production of steel, but to get the best steel output it is essential that the man-power of the industry be conserved in every way and trained to the best advantage. This problem occupied the attention of the Association of Iron and Steel Electrical Engineers on the first day of its annual convention at Baltimore on Sept. 11.

Following a short business meeting, the report of the safety committee was read by its chairman, Mr. Greenwood, on rules for the safe operation of electric cranes. Definite rules for the protection of employees were laid down, and emphasis was placed upon proper methods of securing the compliance of crane operators with these rules. In the discussion which followed it appeared that the convention generally approved of the report, although some engineers felt that plant operations would be interrupted too much by the application of too many rules.

The report of Mr. Gilson, chairman of the educational committee, was then taken up. While there was some difference of opinion regarding the proper administration of such work, it was very generally agreed that all companies should foster this movement not only as a war measure but as a permanent policy. It was predicted that effort and capital invested in the education of electrical operators, inspectors and construction men would be repaid many times and would greatly check the unrest and rapid shifting of employees.

There were 110 registered at the opening session, and this number was considerably increased on the following day. This attendance was considered satisfactory, in view of the stress under which men in the steel industry are now working.

The election of officers, to take effect Jan. 1, 1919, resulted as follows: President, D. M. Petty, Bethlehem Steel Company; first vice-president, B. W. Gilson; second vice-president, H. C. Cronk; secretary, J. F. Kelley; treasurer, James Farrington. Directors chosen were E. S. Jeffries, G. W. Richardson, F. A. Wiley and Walter Kennedy.

In speaking briefly of the activities of the association, President-elect Petty predicted a busy year. He said that the war had placed greater responsibility upon the electrical engineers in the steel industry, both on account of need for increased output and also because it was necessary to use a greater amount of automatic and foolproof apparatus owing to the greater use of unskilled labor.

In place of the usual entertainment features a patriotic banquet was arranged for Thursday evening, to be addressed by General Black, chief of engineers of the United States Army; General Gaston, commander of Camp Meade, and Dr. McDowell, prominent in the army Y. M. C. A. service. Friday afternoon was spent on an inspection trip through the steel works and shipyards of the Bethlehem Steel Company at Sparrows Point, Md.

REVISED SCHEDULE PREPARED OF ESSENTIAL WIRING DEVICES

Committee of Manufacturers Working Out Plan of Conservation Proposes Large Reduction in Number of Devices

Manaufacturers of wiring devices, acting through the wiring devices committee of the General War Service Committee of the Electrical Manufacturing Industry, have prepared a revised schedule of essential devices to be retained in their listings. In the opinion of the manufacturers present at the meetings, the last of which were held on Aug. 27 and 28, the devices scheduled, as published herewith, represented the minimum number of essential building equipment articles needed to carry forward and preserve the electrical equipment of the nation during the period of the war. It was the general opinion that any further reduction would be detrimental to other essential industries and to the government itself.

Each manufacturer has been asked to check carefully his line of devices as cataloged and report to the chairman of the committee his elimination. The large extent of the eliminations is shown in the following:

	Number of Devices Now Listed	Number of Devices Retained	Number of Devices Dropped	Per Cent Reduction
Sockets and receptacles	100	20	80	80
Cut-auts and fuses	500	125	375	75
Miscellaneous	25	20	5	20
	625	165	460	68

Large reductions will also be made in rosettes, attaching plugs, snap switches, knife switches, cut-outs and fuses, but details of these have not yet been compiled.

These important facts in connection with this conservation program were brought out at the meetings:

1. The War Industries Board has made it clear that no development for commercial purposes will be permitted during the period of the war, and especially no manufacturer will be permitted to duplicate the essential devices of some other manufacturer as scheduled herein, provided he is not now making them.

2. The scope of this elimination plan, as given in detail here, covers standard listed devices as made by the various manufacturers of this group for the domestic market. Export business is not considered as coming within this action as it is assumed that any export order for which an export license and priority certificate can be obtained may be filled.

3. Makers of any devices not made by other manufacturers or not included in this schedule must decide for themselves which of such devices are essential and should, for their own protection, make eliminations corresponding to those made in scheduled lines.

4. It is understood that a special device which forms part of some other manufacturer's essential product, upon his affidavit to this effect, may continue to be made, but not listed.

Under the proposed plan no manufacturer shall make more varieties or styles than given below:

SOCKETS AND RECEPTACLES

A—Medium-Base Brass Shell Sockets—
1. (a) Only brush-brass and nickel finishes.
   (b) No special keys; no special length keys; no special length chain guides.
2. No more than two types of shell fastening. (These may be two sizes in the same type.)
3. For each type or size of shell, only.
   (a) One key interior.
   (b) One keyless interior.
   (c) One pull interior.
   (d) One push interior.
4. For each type of shell (but not to include electrolier) only.
   (a) One twin socket interior.
   (b) One key-locking interior.
   (c) One keyless-locking interior.
   (d) One pull-locking interior.
5. Caps—three only; ¼-in., 1⅛-in. and pendent, in each style of fastening.
6. Bases—one style of fastening—only.
   (a) Concealed.
   (b) Cleat.
   (c) 3½-in. outlet box.
   (d) 4-in. outlet box.
   (e) Concealed rosette.
   (f) Wood molding.

B—Miscellaneous Medium-Base Sockets and Receptacles:
1. 60018, 60019, 60020 or equal.
2. 50717 or equal.
3. 4100, 4104 or equal.
4. 4004 or equal.
5. 35024 or equal.
6. Socket reducers: mogul to medium; medium to candelabra; candelabra to miniature.

C—Medium-Base Porcelain Sockets:
1. (a) Only one key, one push, one keyless, and one pull body.
   (b) One key-locking and one keyless-locking interior.
2. Pendent, ¼-in., ⅜-in., and ½-in. caps only.
3. Cleat, concealed, wood molding, 3½-in. and 4-in. box bases only.

D—Medium-Base Porcelain Receptacles:
1. Cleat—9171, 9402, 9403, 4013, 59275 or equal.
2. Cleat (covered contacts)—58300, 58949 or equal.
3. Concealed—4001, 4002 or equal.
4. Molding—4025, 4026 or equal.
5. Sign—not more than two.
6. Canopy—one only.
7. Outlet box—not more than two, viz., 3½-in. and 4-in.
8. Metal covers with weatherproof receptacles—not more than two, viz., 3½-in. and 4-in.

E—Medium-Base Weatherproof Sockets:
Not more than three types.

F—Medium-Base Porcelain Lined Sockets:
1. Not more than one metal.
2. ¾-in. and ½-in. cap, without and with shadeholders.

G—Mogul-Base Sockets and Receptacles:
1. Brass shell, ¾-in. cap only, without shadeholder.
2. Two-piece porcelain, three styles, viz., plain cap, ¾-in. and ½-in. cap.
3. One piece porcelain, three styles, viz., plain cap, ¾-in. and ½-in. cap.
4. One cleat receptacle.

H—Candelabra-Base Sockets and Receptacles:
1. One each, key, keyless, pull, candle and pendent sockets and one cleat receptacle.
2. No miniature base.

ROSETTES
1. One fusible and one fuseless cap with cleat, concealed and molding bases to match.
2. One cleat, with covered contacts.
3. One one-piece fuseless cleat.
4. One molding rosette for mounting on backing.
5. Conduit box—not more than 5.

ATTACHING PLUGS

A—Separable Screw Base—660-watt, two-wire:
1. Not more than three bodies.
2. Not more than four caps.

B—Non-separable Screw Base—660-watt, two-wire:
Not more than two styles.

C—Cord Connectors, Current Taps and Chandelier Plugs:
Not more than five.

D—Surface and Conduit Box Receptacles:
Not more than five.

E—Flush Receptacles, 10 amp. and under:
Not more than five.

F—Flush Receptacle Plates:
1. Only brush-brass and nickel finishes for brass plates.
2. Only one thickness of metal for single gang plates for any one type of receptacle.

SNAP SWITCHES

A—Surface Switches:
1. Only slotted base switches, if both slotted and solid are now made.
2. Only indicating switches, if indicating and plain are now made, single-pole excepted.
3. No switches with special bases for wood or metal molding.
4. No switches with special bases for conduit box or cast-iron fittings.
5. Not more than two types of panelboard switches.
6. No special finishes—one finish only.
7. Standard length of cord on ceiling and wall switches reduced from 10 ft. to 8 ft.

B—Pull and Pendent Switches:
1. Not more than three pull and key socket switches.
2. Not more than two sizes or styles of pendent switches and not more than two caps.
3. Not more than one through cord switch.
4. No special finishes, one finish only.
5. Length of cord on pull socket switches reduced from 10 ft. to 6 ft.

C—Flush Switches:
1. No rotary switches under 20-amp. capacity.
2. Not more than three types of flush switches other than rotary.
3. One type of door switch.
4. No steel plates.
5. All brass plates 0.040-in. and only square cornered, up to and including three-gang.
6. Only brush-brass and nickel finishes.

KNIFE SWITCHES
1. No polished finish switches; eliminate all finish except bright dip or tumbled.
2. N.E.C.S. slate base—not more than one grade in the same capacity. Where more than one grade is now made, eliminate all except the equivalent of Trumbull type C for 60 amp. or under, and all except the equivalent of Trumbull type A above 60 amp.
3. Unmounted.
   (a) Not more than one grade.
   (b) Not more than one current density in same capacity.
4. No low-jaw fused switches, front or back connected.
5. Battery switches—no slate bases.
6. Combination base switches—no duplication of porcelain and slate base above 30 amp.

FUSES AND CUT-OUTS

A—Cartridge Fuses:
1. No polished ferrules; eliminate all finishes except bright dip or tumbled.
2. 250-volt ampere ratings—6, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 100, 125, 150, 175, 200, 225, 250, 275, 300, 350, 400, 500, 600.
3. 600-volt ampere ratings—3, 5, 7, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 100, 125, 150, 175, 200, 225, 250, 275, 300, 350, 400, 500, 600.
4. Renewable fuses—fuse elements of same capacity as above.

Cartridge Fuse Cut-Outs:
1. No duplication of porcelain and slate bases of same capacities, not more than one style for each device retained.
2. Clips, contacts and lugs—no polished finish.
3. Slate cut-out bases, single pole only.

Plug Fuses:
1. Ampere ratings—6, 10, 15, 20, 30.

Plug Cut-Outs:
One Fuse only.

Similar work having as its motive the elimination of many types in accordance with the wishes of the War Industries Board is under way in about twenty-five group committees of the industry.

ELECTRICAL STANDARDIZATION FOR LARGE HOUSING PROJECTS

Materials Which Will Be Needed in the Extensive Government Program to Be Standardized in the National Interest

A plan for standardization of the electrical materials which will be needed in the extensive housing projects contemplated by the government is being worked out.

Charles E. Dustin, general secretary of the Associated Manufacturers of Electrical Supplies, was asked to go to Washington last week by Richard L. Humphrey, chief of the building materials section of the War Industries Board, to discuss arrangements for getting the movement started. It is believed that the coöperation of the manufacturers in the standardization of such electrical supplies as are needed in ordinary construction will save complication and trouble for the government in the prosecution of the war program.

To further this end a general conference of representatives of manufacturers producing the supplies needed in the government housing projects was called for Sept. 13 in Washington. It was expected that this conference would result in the formation of a war service committee of the building materials section of the War Industries Board. Representatives of the manufacturers in the following groups and of such other materials as will be required in the government housing projects are to take part in the movement: Control, conduit of different types, heating devices, wiring devices, industrial, outlet box, interior fixtures, porcelain, wire and cable, panelboard and switchboard.

Need of $200,000,000 for War Power Plants

Requirements of the United States Shipping Board Emergency Fleet Corporation Among the Vital Important Developments Which Will Be Supplied Fully Under the Government Program

TESTIMONY before the House of Representatives committee on interstate and foreign commerce on the two-hundred-million-dollar government emergency power act, as published in the last two issues of the ELECTRICAL WORLD, presented mainly the points of view of the War Industries Board, the army and the navy. Herewith there is printed additional testimony giving the standpoint of the United States Shipping Board Emergency Fleet Corporation.

TESTIMONY OF MAURICE L. COOKE

In beginning his testimony, Maurice L. Cooke, Washington representative of the Emergency Fleet Corporation and assistant to the chairman of the Shipping Board, handling power matters, said that Edward N. Hurley would be at the service of the committee immediately upon his return to Washington in case the committee should want to supplement his statements.

"There are acute situations," Mr. Cooke said, "at Chester, Pa.; Seattle, Wash.; Portland, Ore.; Norfolk, Va.; Gloucester, N. J.; Wilmington, N. C., and San Francisco." Those are just points with which Mr. Cooke happened to have personal acquaintance. There are similar situations in a number of other shipyards. Pending a decision by Congress as to how it wanted the administration to handle the matter of power, the Secretary of War, Secretary of the Navy and chairman of the Shipping Board have been coöperating to see how they could tide over this emergency situation. A working agreement was reached that no one would make a contract for power without allowing the others to "sit in and comment on the proposition."

The War Department assumed the leadership in the Pittsburgh district, the Navy Department in the New Jersey district and the Shipping Board in the Philadelphia district. The latter district not only includes Philadelphia but reaches into Chester and Bristol, Pa., and Wilmington, Del., and ultimately may cross the river into New Jersey.

The Philadelphia Electric Company, testified Mr. Cooke, anticipates a shortage in Philadelphia in the coming winter. In some respects a shortage is existing now, not a shortage in the territory as a whole but in some distribution districts. Mr. Cooke mentioned the district in which the Midvale Steel Works are located as one where there is already an inability on the part of the company to supply power and where during the coming winter unless some effective action can be taken there will be a shortage. For the winter of 1919-1920 the apparent shortage is all the way from 50,000 kw. to more than 100,000 kw.

Mr. Cooke said that it had been asked what attitude the companies were going to take under the proposed legislation. The Philadelphia company, he added, claimed that to carry out the most conservative construction program which would meet the situation as it would develop before the end of the winter of 1919-1920 would require the expenditure of $20,000,000.

"Our estimates," said Mr. Cooke, "however, are that $13,000,000 is probably nearer the figure." He noticed that the War Industries Board had given a figure of $15,000,000.

"Personally," declared Mr. Cooke, "I do not believe it is possible to come much nearer than those figures because labor is the big gamble, and I do not believe any of us can foresee the conditions that are going to obtain in the next eighteen months in the matter of labor, to come much nearer the final estimate and get a better estimate than is represented by those three figures."

After conferences with officials of the Philadelphia Electric Company and their bankers, the authorities thus far have been unable to get a proposition from them that they felt they could accept. They have made a proposition to the company somewhat along the lines of the one that Secretary of War Baker described for the Pittsburgh district, offering to put up 40 per cent of the cost of construction with the understanding that that included war wastage plus a margin of safety. The war wastage was to be figured two years after the war by a method of arbitration and was defined as meaning the difference between the then normal cost of this construction and what it actually cost.

Mr. Cooke said that he supposed that 25 per cent of the cost of construction is as good a guess of what that war wastage would be as can be arrived at. The reply of the company to the proposition was that if the authorities would reverse the figures and advance 60 per cent and allow the company to put up 40 per cent, possibly they could get together.

"We felt," Mr. Cooke continued, "that in putting up 40 per cent we were going somewhat beyond war wastage and that we were getting into a position where we were financing private corporations rather than producing the necessary power."

If it is possible to get together with the company, the energy will still have to be produced, because a shortage of 60,000 kw. as the authorities estimate it and more than 100,000 kw. as the company estimates it is absolutely certain for the winter of 1919-1920. Of that shortage, about 50 per cent is for the shipyards, 10 per cent for the army, 10 per cent for the navy and 30 per cent distributed so that the responsible department can scarcely be determined.

ALTERNATIVE PLANS FOR PHILADELPHIA

Mr. Cooke mentioned several things that could be done. He said:

"We can build an isolated power plant in connection with the Hog Island yard, which would be a distinct step backward. We can go in and build this proposed new plant of the Philadelphia Electric Company at Beach and Palmer Streets on the Delaware River, build it and own it for the government, but that would apparently lead to a more direct interest in the operation of that company than would seem desirable. It might even lead to taking the same steps as have been taken at Norfolk,

Va., where the government has frankly taken over the operation of the local company."

At Portland, Ore., Mr. Cooke testified, the situation is much the same except that the companies there say that they cannot do anything. At Wilmington, N. C., it is hoped to make a bargain comparable to the one made in Pittsburgh. He added:

"After all, in these places where either the Emergency Fleet or the army or the navy has been able to make reasonably satisfactory arrangements, the operating companies are almost negligible as compared with the whole demand, so that unless this bill is passed, or some equivalent legislation, it will in some parts of the program during the coming winter and through the entire military program in the following winter make a very serious curtailment in our war preparations."

INDEPENDENT HOG ISLAND PLANT CONSIDERED

In discussing the matter of building an independent plant at the Hog Island Yard, Mr. Cooke said that of course such a plan "would be a step backward, one absolutely opposed to the principle on which this bill was drawn, of having one great system where the peak of one district might be helped by drawing in energy from other districts where the peak did not occur at the same hour of the day.

Discussing the question of rates, Mr. Cooke testified: "It is hardly possible, it seems to me, that the government, building in these times of high prices, can undersell local companies. I think it is entirely possible that the government may be tempted to charge higher rates for the time being and in certain places than the local companies; and, personally, I see no reason why they should not put a surcharge, a supercharge, on some contracts to take care of that, without disturbing the general system of charging throughout that district."

Taking the case of the Midvale Steel Company as an example, Mr. Cooke discussed the possibility that this company might be in a district which after the war would be oversupplied with electrical energy.

"Rather than change the whole system of electric charges in the Philadelphia district," he added, "I can easily see that the War Department might enter into an arrangement by which as long as those gun contracts and other contracts were operating the Midvale would pay somewhat extra for at least that part of its load which was used on certain stipulated contracts and that would become a part of the expense of building the particular things that were being built under those contracts."

Answering a question by Representative Winslow as to the trend of thought of those who have been building up the bill regarding the equalization of charges for power under this legislation and the charges of companies operating under old contracts, Mr. Cooke said:

"I should imagine, for instance, if we would go ahead with one possible solution in Philadelphia, to take over the building of a new plant there under the plans of the Philadelphia Electric Company, we would in the very nature of things be forced to sell that current to the Philadelphia Electric Company, because they have the distribution system, and I should imagine it would be a relatively easy matter to arrive at a figure at which current was to be sold and they would continue to sell that current to most of their customers under the scale of charges fixed by the Pennsylvania Public Service Commission."

Representative Parker of New Jersey asked Mr. Cooke about the margin between wholesale rates and retail rates.

Mr. Cooke testified that there was a large margin between these classes.

Mr. Parker—And that margin is therefore so large that a change in the wholesale rates, a rather larger wholesale rate, would not be expected to affect the retail rates at all?

Mr. Cooke—Certainly not so much as you would expect.

Representative Parker then asked other questions bearing on rates and took up the subject of the rate of the Midvale Steel Company.

Mr. Cooke—I rather imagine that their rate is perhaps higher than you would expect to find it, because if I recall rightly they had to put in a long high-tension line to reach them, and it has been the practice of that company—and I am not criticising it—to, the first two years of the contract, help absorb part of the cost of the distribution system through a charge that would be a little higher.

The discussion then turned to the question of the attitude of commissions.

Mr. Cooke mentioned the contract between the Philadelphia Electric Company and the Philadelphia Rapid Transit Company. The latter company having a contract for a rate of 0.7 cent acquiesced in the ruling by the state Public Service Commission that raised the rate to 0.75 cent.

PROGRAM NOT YET INTERFERED WITH

Representative Esch said that when Congress gave the Emergency Fleet Corporation the duty of constructing ships this carried with it the power to develop the necessary energy for such construction. "That being true," he added, "is there a shortage of power development under the Emergency Fleet Corporation for the constructive program which that corporation is undertaking?"

Mr. Cooke—At the moment our program is not being held back on account of power shortage, but we are guarding against shortages that to-morrow or next week will become real, in the absence of action, even though the retardation of the program will not ensue for a year or eighteen months later.

Adding that future needs were being anticipated, Mr. Cooke said that in the Philadelphia district it is just the difference between the judgment of two engineers "as to whether if we begin to-morrow we will avoid the shortage that is threatened in the winter of 1919-1920. One group of engineers says it can be done in fourteen months; another says it will take eighteen months."

Representative Esch—Well, my idea is that the Fleet Corporation now has the power to build as much power plant as is necessary.

Mr. Cooke—We have got the money and the power to provide the necessary current, but if we simply go ahead and act on that, we will be developing at many points independent isolated plants that are not as efficient as the central stations or the superstations would be and we hesitate to do that.

Answering a question by Representative Esch as to

the situation in the Puget Sound district, Mr. Cooke said that, as he recalled, between 50 and 60 per cent of the power used in shipyards was now provided by the Seattle municipal plant. The city of Seattle recently obtained permission from the Capital Issues Committee to issue $5,500,000 in bonds for hydroelectric development. It is hoped by this improvement that the needs in that district will be taken care of before the peak, which is expected to come next summer. The private company had a project for increasing facilities and it is asking for government assistance.

Lieut. W. W. Stanley, who was present at the hearing, said that the company was asking for government assistance, but that he did not know whether it would do so now as the municipal plant was going ahead.

Representative Esch also asked questions as to the further development and the use of electrical energy in connection with the manufacture of war munitions. Mr. Cooke expressed the opinion that this must take place not only in connection with munitions but generally. Lieutenant Stanley, replying to questions along the same line, discussed briefly the progress of the electric furnace and electric welding.

Representative Esch—That would be an additional reason for increasing power development.

Mr. Cooke—I should imagine that if we come in three months later with a program, we would even in that short time have made considerable additions to the requirements, for the several reasons you have mentioned, as well as others.

Representative Parker raised a question whether by manufacturing energy the government might save enough to pay for the plant. Mr. Cooke said that the War Industries Board had tentative estimates of the cost at every point where financial assistance had been required. Representative Parker asked for a memorandum comparing the cost of producing energy and the rates paid by the government for energy. This will be furnished by Mr. Cooke.

Representative Esch—This bill contemplates that the government itself may construct a separate independent plant, and it also contemplates that the government can aid in increasing the power facilities of existing plant. The government will not use the first power if reasonable concessions can be made with the existing plant.

Mr. Cooke—I should say that would be good policy.

Representative Esch—Would there be some isolated sections where, owing to the absence of existing plants, new construction would be a necessity?

Mr. Cooke—The country is pretty well covered, Mr. Esch, but I would not be surprised if in the course of a year or two some such situation as you have in mind would develop.

Representative Esch—Could or would the government use this power granted in this bill in a coercive way to secure a beneficial contract or agreement with existing plants?

Mr. Cooke—I think when the government has this power that the private companies as a rule, will come forward with better propositions than they are in a position to come forward with now. They are pretty apt to follow some general principle, and they realize that the government is not now in a position to afford any general relief; and should this bill or some comparable measure pass, I think they will be in a position to be much more generous in providing private funds than they are to-day.

Hearing This Week

The House committee on interstate and foreign commerce held another hearing on Thursday of this week on the emergency power bill, which would appropriate $200,000,000 so that the government may create additional power facilities as a war measure. The additional session was for the purpose of hearing again Eugene Meyer, Jr., and so that Mr. Gans, lawyer in the office of Felix Frankfurter of the War Labor Board who drew the bill, might explain some points.

Chairman Sims of the committee reported that when the revenue bill is disposed of in the House next week the emergency power bill will obtain the right of way.

In the meanwhile it has developed that members of the committee desire amendments which shall make clear that the bill shall not apply to water-power plants. Judge Sims says that the bill as now framed allows assistance to hydroelectric power plants or permits hydroelectric development, and he sees no objection to that, but he says that when the committee begins to vote on the bill by amendments it will probably make sure that water powers are out of the measure.

WATER-POWER BILL PASSED BY HOUSE OF REPRESENTATIVES

Measure Now in Stage of Conference Between the Committees of the House of Representatives and the Senate

The House of Representatives has passed the administration water-power bill in the form in which it was reported by the conference committee of the House. "Net investment" was retained in the recapture clause, instead of "fair value." The committee indorsed "net investment." The bill now goes to conference.

ANNUAL MEETING OF EDISON ASSOCIATION

L. L. Elden Elected President at the Gathering Held in New York for Organization Purposes This Week

At a formal meeting of the Association of Edison Illuminating Companies in the Engineering Societies Building, New York City, on Sept. 10, at which the proceedings were confined mainly to those necessary for organization purposes, L. L. Elden, Edison Electric Illuminating Company, Boston, was elected president. Other officers elected were: Vice-president, Robert Lindsay, Cleveland Electric Illuminating Company; secretary, H. T. Edgar, Edison Electric Illuminating Company, Boston; treasurer, W. W. Freeman, Union Gas & Electric Company, Cincinnati.

An executive committee was also elected, as follows: Charles L. Edgar, Edison Electric Illuminating Company, Boston; Samuel Insull, Commonwealth Edison Company, Chicago; John W. Lieb, New York Edison Company; Joseph B. McCall, Philadelphia Electric Company; W. F. Wells, Brooklyn Edison company.

NEW PREFERENCE LIST OF THE WAR INDUSTRIES BOARD

Priority of Industries Governing the Distribution of Labor, Capital, Facilities, Material, Transportation and Fuel

B. M. Baruch, chairman of the War Industries Board, has issued the new preference list of industries and plants, compiled by the Priorities Division of the board.

E. B. Parker, chairman of the Priorities Division, states that the determination of the relative importance of all industries and plants for both production and delivery by a single agency, the War Industries Board, renders it possible to maintain a well-balanced program with respect to the several factors entering into production, which includes, among other things, plant facilities, fuel supply or electrical energy, labor and transportation, without all of which production is impossible.

Judge Parker says: "The administration of priorities is calculated to bring order out of chaos and to develop an evenly balanced industrial program to meet the requirements of the military program, and at the same time supply the essential requirements (as distinguished from the mere wants or desires) of the civilian population. Now that it is understood that priority and preference cannot be purchased, the tendency is for prices to assume more nearly the normal level. It is now the public interest rather than the dollars of the purchaser that determines precedence in production and delivery."

An explanatory statement signed by Mr. Baruch and Judge Parker says in part:

For the guidance of all governmental agencies and all others interested (1) in the production and supply of fuel and electric energy, (2) in the supply of labor, and (3) in the supply of transportation service by rail, water, pipe lines or otherwise, in so far as such service contributes to production of finished products, the accompanying designated Preference List No. 2 has been adopted by the Priorities Board, superseding Preference List No. 1, adopted April 6, 1918, and all amendments and supplements thereto.

Where it is imperative not only to maintain but to stimulate and increase production to satisfy abnormal demands created by war requirements, a high rating is necessary, even though the intrinsic importance of the product may be less than that of other products placed in a lower classification because of the fact that the supply of such other products equals the demand without the stimulus of high priority. Where it is necessary to speed the production of a particular product required at a particular time to carry into effect an important program, a high priority is given although changing conditions may thereafter suggest and demand a reclassification. Certain plants produce commodities of great relative importance, but at the same time produce other commodities of less relative importance, and under such circumstances consideration and weight is given to the ratio of production between the more important and less important commodities. Instances occasionally arise where individual plants are given preference so long as they are rendering, and so long as it is in the public interest that they should render, a particular service, even though, taking the country as a whole, the supply of their product is ample to meet all demands.

The industries and plants grouped under Class 1 are only such as are of exceptional importance in connection with the prosecution of the war. Their requirements must be fully satisfied in preference to those of the three remaining classes.

Requirements of industries and plants grouped under Class 2, Class 3 and Class 4 shall have precedence over those not appearing on the preference list. As between these three classes, however, there shall be no complete or absolute preference. It is not intended that the requirements of Class 2 shall be fully satisfied before supplying any of the requirements of Class 3, or that those of Class 3 shall be fully satisfied before supplying any of those of Class 4. The classification does, however, indicate that the industries and plants grouped in Class 2 are relatively more important than those in Class 3, and that those in Class 3 are relatively more important than those in Class 4. It will often happen that after satisfying the requirements of Class 1 the remaining available supply will be less than the aggregate requirements of the other three classes, in which event such supply will be rationed to the industries and plants embraced within those classes. The Priorities Board will from time to time, after conference, and in coöperation with each of the several governmental agencies charged with the distribution thereof, determine particular principles, values and methods of application which may be followed in allocating fuel, power, transportation and labor respectively, to the end that proper reorganization and weight may as far as practicable in each case be given to the relative importance of Class 2, Class 3 and Class 4.

East plant listed as such shall not later than the fifteenth of each month file with the secretary of the Priorities Board, Washington, D. C., a report on P.L. Form No. 3, covering its activities during the preceding month. Any plant failing to file such report will be dropped from the preference list.

Priorities in the supply and distribution of raw materials, semi-finished products and finished products shall be governed by Circular No. 4, issued by the Priorities Division of the War Industries Board under date of July 1, 1918, and all amendments and supplements thereto or substitutes therefor.

This preference list shall be amended or revised from time to time by action of the Priorities Board to meet changing conditions. The Priorities Commissioner shall under the direction of and with the approval of the Priorities Board certify additional classes of industries and also certify additional plants whose operations as a war measure entitle them to preference treatment.

LIST OF INDUSTRIES

Agricultural Implements.—See "Farm Implements."

Aircraft.—Plants engaged principally in manufacturing aircraft or aircraft supplies and equipment.—1.

Ammunition.—Plants engaged principally in manufacturing same for the United States government and the Allies.—1.

Army and Navy.—Arsenals and navy yards—1.

Army and Navy.—Cantonments and camps. -1.

Arms (small).—Plants engaged principally in manufacturing same for the United States government and the Allies.—1.

Bags.—Hemp, jute and cotton Plants engaged principally in manufacturing same.—4.

Blast Furnaces.—Producing pig iron —1.

Boots and Shoes.—Plants engaged exclusively in manufacturing same.—4.

Brass and Copper.—Plants engaged principally in rolling and drawing copper brass and other copper alloys in the form of sheets, rods, wire and tubes.—2.

Buildings.—See 'Public Institutions and Buildings."

Chain.—Plants engaged principally in manufacturing iron and steel chain.—3.

Chemicals.—Plants engaged principally in manufacturing chemicals for the production of military and naval explosives, ammunition and aircraft and chemical warfare.—1.

Chemicals—Plants, not otherwise classified and listed, engaged principally in manufacturing chemicals.—4.

Coke.—Plants engaged principally in producing metallurgical coke and by-products, including toluol.—1

Coke.—Plants, not otherwise classified and listed, producing same.—2.

Copper and Brass.—See "Brass and Copper."

Cotton.—Plants engaged in the compression of cotton.—4.

Cotton Textiles.—See 'Textiles.'

Cranes.—Plants engaged principally in manufacturing locomotive or traveling cranes.—2.

Domestic Consumers.—Fuel and electric energy for residential consumption, including homes, apartment houses, residential flats, restaurants and hotels.—1.

Domestic Consumers.—Fuel and electric energy not otherwise specifically listed.—3.

Drugs.—Medicines and medical and surgical supplies. Plants engaged principally in manufacturing same.—4.

Electrical Equipment.—Plants engaged principally in manufacturing same.—3.

Explosives.—Plants engaged principally in manufacturing same for military and naval purposes for the United States government and the Allies.—1.

Explosives.—Plants not otherwise classified or listed, engaged principally in manufacturing same.—3.

Farm Implements.—Plants engaged principally in manufacturing agricultural implements and farm operating equipment.—4.

Feed.—Plants engaged principally in preparing or manufacturing feed or livestock and poultry.—1.

Ferro-Alloys.—Plants engaged principally in producing ferro-chrome, ferro-manganese, ferro-molybdenum, ferro-silicon, ferro-tungsten, ferro-uranium, ferro-vanadium and ferro-zirconium.—2.

Fertilizers.—Plants engaged principally in producing same.—4.

Fire Brick.—Plants engaged principally in manufacturing same.—4.

Foods.—Plants engaged principally in producing, milling, refining, preserving, refrigerating, wholesaling or storing food for human consumption embraced within the following description: all cereals and cereal products, meats, including poultry, fish, vegetables, fruit, sugar, syrups, glucose, butter, eggs, cheese, milk and cream, lard, lard compounds, oleomargarine and other substitutes for butter or lard, vegetable oils, beans, salt, coffee, baking powder, soda and yeast; also ammonia for refrigeration.—1.

Foods.—Plants engaged principally in producing, milling, preparing, refining, preserving, refrigerating or storing food for human consumption not otherwise specifically listed (excepting herefrom plants producing confectionery, soft drinks and chewing gum).—3.

Food Containers.—Plants engaged principally in manufacturing same.—4.

Foundries.—(Iron.) Plants engaged principally in the manufacture of gray iron and malleable iron castings.

Fungicides.—See "Insecticides and Fungicides."

Gas.—See "Oil and Gas," also "Public Utilities."

Guns.—(Large.) Plants engaged principally in manufacturing same for the United States government and the Allies.—1.

Hospitals.—See "Public Institutions and Buildings."

Ice.—Plants engaged principally in manufacturing same.—3.

Insecticides and Fungicides.—Plants engaged principally in manufacturing same.—4.

Laundries.—4.

Machine Tools.—Plants engaged principally in manufacturing same.—2.

Medicines.—See "Drugs and Medicines."

Mines.—Coal.—1.

Mines.—Producing metals and ferro-alloy minerals.—2.

Mines.—Plants engaged principally in manufacturing mining tools or equipment.—3.

Navy.—See "Army and Navy."

Navy Department.—See "War and Navy Departments."

Newspapers and Periodicals.—Plants engaged principally in printing newspapers or periodicals which are entered at the post office as second-class mail matter.—4.

Oil and Gas.—Plants engaged principally in producing oil or natural gas for fuel or for mechanical purposes, including refining or manufacturing oil for fuel, or for mechanical purposes.—1.

Oil and Gas.—Pipe lines and pumping stations engaged in transporting oil or natural gas.—1.

Oil and Gas.—Plants engaged principally in manufacturing equipment or supplies for producing or transporting oil or natural gas, or for refining and manufacturing oil for fuel or for mechanical purposes.—3.

Paper and Pulp.—See "Pulp and Paper."

Periodicals.—See "Newspapers and Periodicals."

Public Institutions and Buildings.—(Maintenance and operation of.) Other than hospitals and sanitariums.—3.

Public Institutions and Buildings.—(Maintenance and operation of.) Used as hospitals or sanitariums.—1.

Public Utilities.—Gas plants producing toluol.—1.

Public Utilities.—Street railways, electric lighting and power companies, gas plants not otherwise classified, telephone and telegraph companies, water-supply companies, and like general utilities.—2.

Public Utilities.—Plants engaged principally in manufacturing equipment for railways or other public utilities.—2.

Pulp and Paper.—Plants engaged exclusively in manufacturing same.—4.

Railways.—Operated by United States Railroad Administration.—1.

Railways.—Not operated by United States Railroad Administration (excluding those operated as plant facilities.)—2.

Railways.—(Street.) See "Public Utilities."

Rope.—See "Twine and Rope."

Rope Wire.—See "Wire Rope."

Sanitariums.—See "Public Institutions and Buildings."

Ships.—(Maintenance and operation of.) Excluding pleasure craft not common carriers.—1.

Ships.—Plants engaged principally in building ships, excluding (a) pleasure craft not common carriers, (b) ships not built for the United States government or the Allies nor under license from United States Shipping Board.—1.

Soap.—Plants engaged principally in manufacturing same.—4.

Steel-Making Furnaces.—Plants engaged solely in manufacturing ingots and steel castings by the open hearth, Bessemer, crucible or electric furnace process, including blooming mills, billet mills and slabbing mills for same.—1.

Steel-Plate Mills.—1.

Steel-Rail Mills.—Rolling rails fifty or more pounds per yard.—2.

Steel.—All plants operating steel rolling and drawing mills, exclusive of those taking higher classification.—3.

Surgical Supplies.—See "Drugs and Medicines."

Tanners.—Plants engaged principally in tanning leather.—4.

Tanning.—Plants engaged principally in manufacturing tanning extracts.—4.

Textiles.—Plants engaged principally in manufacturing cotton textiles, including spinning, weaving and finishing.—4.

Textiles.—Plants engaged principally in manufacturing woolen textiles, including spinners, top makers and weavers.—4.

Textiles.—Plants engaged principally in manufacturing cotton or woolen knit goods.—4.

Textiles.—Plants engaged principally in manufacturing textile machinery.—4.

Tin Plates.—Plants engaged principally in manufacturing same.—3.

Tobacco.—Only for preserving, drying, curing, packing and storing same—not for manufacturing and marketing.—4.

Toluol.—See "Coke," also "Public Utilities."

Tools.—Plants engaged principally in manufacturing small or hand tools for working wood or metal.—7.

Twine.—(Binder and Rope.) Plants engaged principally in manufacturing same.—4.

War and Navy Departments.—Construction work conducted by either the War Department or the Navy Department of the United States in embarkation ports, harbors, fortified places, flood protection operations, docks, locks, channels, inland waterways and in the maintenance and repair of same.—2.

Wire Rope and Rope Wire.—Plants engaged principally in manufacturing same.—2.

Woolen Textiles.—See "Textiles."

(The term "principally" means 75 per cent of the products mentioned.)

CONVENTION OF PENNSYLVANIA ELECTRIC ASSOCIATION

War-Time Economies and the Necessity for Increased Rates Chief Topics of Discussion at Two-Day Session

The eleventh annual meeting of the Pennsylvania Electric Association was held at Bedford Springs, Pa., Sept. 6 and 7. Reflecting the spirit of the times, the entire work of the convention was concentrated on war-time economies in the generation, distribution and use of electricity and on the financial problems entailed in the successful conduct of the business.

Routine matters, together with the reports of special committees and the address of President Henry N. Müller of Pittsburgh, were disposed of in the opening session. Owing to the draft and enlistments, the association, which is a state branch of the National Electric Light Association, has suffered a considerable decrease in membership, especially among Class B members. The work of the association has, however, gone steadily forward although in less energetic form. In his address President Müller made a plea for wider recognition and use of the geographic sections as a means for disposing of local problems confronting the utilities.

Overhead-Line Construction

The principal report was that of the engineering committee having to do chiefly with overhead-line construction. For years the electric light and telephone companies of the State of Pennsylvania have been discussing the joint use of poles on the public highways, but they have never been able to come to an agreement owing to the attitude of the telephone companies regarding circuits carrying potentials of 5000 volts and above. At conferences between the lighting and telephone interests the engineering committee finally recommended two separate sets of specifications for joint-pole occupancy, one dealing with voltages up to 5000 and the other with voltages above 5000. The construction is to be in conformity with the National Electric Safety Code promulgated by the Bureau of Standards. Individual consideration is to be given each particular job, and it was agreed that deliberation should center entirely on whether there should be joint occupancy or separate pole lines. Thus far no definite agreement between the telephone and electric light interests in the State of Pennsylvania has been reached. It is felt, however, that with the widely increasing use of electricity for industrial and power uses voltages above 5000 will become more and more employed so that the limitation of 5000 now insisted upon by the telephone interests will hamper the proper expansion of the electric power business. Another interesting report was made by the accounting committee, of which H. R. Kern of Philadelphia is chairman.

Operating Papers Discussed

The technical session was held under the direction of the geographic section committee, of which S. C. Pohe of Clearfield is chairman. Five papers were presented as follows: "Theft of Electricity," by H. A. Heslip of Pittsburgh; "Economies in Pole Line Operation and Maintenance," by J. F. Cole of Altoona; "The Necessity for Increased Rates," by Henry Harris of Wilmerding and Ralph J. Baker of Pittsburgh; "Utilization of the Idle Hours of Station and Substation Employees," by C. W. Ward of Pittsburgh, and "Transportation Problems," by W. T. Watson of Philadelphia.

Mr. Heslip's paper dealt with the various methods discovered of tampering with meters and the steps taken by the Duquesne Light Company in detecting the fraud and bringing the guilty parties to account.

Mr. Cole's paper was based on material gathered from large and small operating companies in Pennsylvania. It dealt particularly with the importance and value of adopting standards of overhead-line material and types of construction which tend to cheapen and simplify maintenance. The necessity for careful and systematic inspection of poles was emphasized, and the advantages of other practices such as standard sizes of wire for distribution and commercial service connections, the use of different shapes and different colored insulators for different classes of service, and the replacing of small transformers with larger sized units, each of which would feed a separate network of secondary distributing mains, were enumerated. The idea brought out by the author was that not a cent's worth of material or a minute's time should be wasted.

The necessity for higher rates is, of course, generally recognized throughout the industry, the only question confronting the management of central-station companies being the size of the needed increase rather than the necessity of it. Henry Harris discussed this question from the managerial side and Ralph J. Baker from the legal side.

The draft has taken from electric lighting companies a large number of employees so that the executives are faced with the task of rendering service with more limited resources both of men and of money. Mr. Ward in his paper took up the problem of systematically utilizing the idle hours of station and substation attendants as a matter of economy. His plan is of more interest to medium-sized and large companies. Additional work suggested for filling in the time of substation attendants and others is as follows: Making tracings, repairing and testing meters, refilling fuses, reclaiming pole-line hardware, repairing street-lighting equipment, arc lamps, linemen's tools, primary cut-outs, transformer leads, etc., splicing short pieces of wire, cutting scrap wire into tie wire, burning insulation from scrap wire, cleaning windows, repairing buildings, painting, etc. Local conditions will, of course, decide what operations, if any, can be assigned advantageously to men whose time is not entirely occupied.

W. T. Watson's paper on "Transportation Problems" was devoted particularly to the advantages of the electric vehicle for central-station transportation purposes.

Fuel Problems

At the session of the evening of Sept. 6 addresses were made by W. C. Anderson of the National Electric Light Association, E. L. Cole, the director of the conservation division of the Federal Fuel Administration of Pennsylvania, and W. D. B. Ainey, chairman of the Pennsylvania Public Service Commission.

Mr. Cole told of the serious power shortage in various sections of Pennsylvania and of the steps taken by the Fuel Administration to broaden the peak load and shift the hours of labor so as to make continued employment

possible, without interfering with the production of war necessities. The government has decided that coal-mining companies shall have preference in the supply of power, and yet to give the mines of Pennsylvania all the power they need would hamper other industries, a procedure which is not in accord with the policies of the Fuel Administration. By closing department stores until 10 o'clock in the morning and after 4:30 in the afternoon the railway companies of Philadelphia, for instance, are enabled to transport ship and munition workers to advantage without crippling the public utilities.

The Fuel Administration of Pennsylvania, Mr. Cole said, was also instrumental in drafting the present bill before Congress, appropriating $200,000,000 for the construction of power plants. More than half of it, it is anticipated, will be used to finance power plants in the anthracite regions, the electricity generated to be transmitted to Philadelphia, New Jersey and Maryland over the lines of existing public utilities. It is the hope of the Fuel Administration that the erection of these power plants will initiate a permanent means of conserving fuel and at the same time provide power at the lowest possible cost for manufacturers in peace times. It is expected also that the power plants will be the first of a series of plants to be erected at points where coal is produced.

Officers were elected as follows: President, Thomas Sproule, Philadelphia Electric Company; first vice-president, W. R. Kenney, West Penn Power Company, Connellsville; second vice-president, Ernest H. Davis, Lycoming Edison Company, Williamsport; treasurer, A. H. S. Cantlin, Lehigh Valley Light & Power Company, Allentown. Three members elected to the executive committee were Henry Harris, Wilmerding; H. H. Ganser, Counties Gas & Electric Company, Norristown, and John S. Wise, Hazleton, Pa.

JOINT COUNCIL OF NATIONAL ENGINEERING SOCIETIES

San Francisco Sections of Five National Societies Organize for Effective Action in Local Matters of Civic Engineering

Five national engineering societies which have San Francisco sections on Sept. 4 organized what is to be known as the Joint Council of the Engineering Societies of San Francisco. The societies represented are the American Society of Civil Engineers, the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the American Institute of Mining Engineers and the American Chemical Society. Four representatives from each of these societies, making twenty men in all, form the joint council, which in turn is officered by an executive committee of five. The members of this executive committee are: C. D. Marx, chairman; E. C. Jones and E. C. Hutchinson, vice-chairmen; N. A. Bowers, secretary-treasurer, and E. O. Shreve, assistant secretary.

This organization is the outcome of several meetings of the secretaries of the five societies involved at which plans for more effective inter-society coöperation have been worked out. Some of the expected advantages are a closer touch among members of the several associations, putting the several employment bureaus together in one central office, joint meetings to discuss subjects of common interest, coöperation for the sake of economy as in mailing notices, consolidating headquarters at the Engineers' Club, etc.

In a paper on this subject read at a recent joint meeting it was pointed out that "membership in a national engineering society has always carried with it a certain amount of prestige. Here in the Far West we have been content with little besides that as a return for our annual dues. In recent years local sections have taken on new importance, and it is not now uncommon to find the man who believes he can get more real benefit from his local section than from the national organization.

"Our parent societies have joined in forming the United Engineering Society, and the plan has proved eminently successful from every angle. May we not begin now to lay the foundation for branches of that organization in Western centers? Why not the San Francisco branch of the United Engineering Society? At least we may suggest this as an ultimate possibility, another incentive among the opportunities that await our pioneer joint council."

PURPOSE OF THE ORGANIZATION

The joint council will have regular meetings once a month, the executive committee convening at the pleasure of its members. The constitution tentatively adopted at the Sept. 4 meeting sets forth the following as the purposes of the organization:

1. To foster closer relationship among the engineering societies of San Francisco, especially in those matters (a) where coöperation will make for more efficient "win the war" service, (b) where coöperation will make for more efficient service to the State of California, its cities and counties, and (c) where coöperation will expedite progress toward those ideals common to our several organizations.

2. To plan and carry out arrangements for joint meetings of the several societies whenever such meetings are deemed advisable and to endeavor to make joint meetings effective in developing closer relationships among members of the several societies.

3. To act generally as the clearing house for matters which involve the several societies, especially where the common good will be enhanced by working through an executive head representative of the several organizations.

The first act of the joint council, typical of the work that lies before it, was the decision to urge upon the Governor of the state the appointment of an engineer as member of the State Railroad Commission. In making this recommendation it was pointed out that "the best interest of the state would be served by the appointment of engineers as members of commissions dealing with problems the solution of which requires technical training and experience" and that the appointment of an engineer to fill one of the vacancies on the State Railroad Commission would doubtless "be regarded by the people of the state as indicating a wish to place the public service on the highest plane of efficiency and will be creditable both to the appointing power and to the engineering profession."

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Rates According to Size of Communities.—Allowing higher rates for the Galva Electric Company, the Illinois Public Utilities Commission reaches also an opinion on the point set forth below: "Contention was made by representatives of the city of Galva that, on account of the fact of the larger size of the city of Galva, the rates charged for electric service should be less than those charged in other communities. There is no evidence in the record tending to substantiate this contention, and it would appear from a general knowledge of the situation quite probable that the costs of production and distribution in Galva were seriously influenced by the fact that other communities are receiving service from the same power plant. Such an influence would necessarily result in more efficient plant operation, due to the increased load factor, to the fact that the plant can operate more efficiently if producing a large quantity of energy than it could with a small quantity, and to other similar considerations. Viewing the matter from this standpoint, it would appear probable that the city of Galva might well be considered as benefiting by the fact that a large number of consumers receive service from this source with resulting economies in which all consumers should share. Basing its conclusion upon the record herein, the commission will make no distinction in the rates authorized as between Galva and the other communities."

The Need of the Present Hour.—In authorizing higher electric rates for the Oklahoma Gas & Electric Company the Oklahoma Corporation Commission says in part: "Neither the record in this case nor any information in the possession of the commission contradicts the showing in the application herein as to the need for the increase asked. The commission is convinced that the need of the present hour, instead of promising to disappear with the eventualities of the next few months, will become more urgent and imperative. The figures above considered indicate that the applicant is not immune from the operation of the economic law which governs the affairs of mankind in general, and of the American people and of the people of Oklahoma like the rest. The man who builds a house at this time finds that on account of the increase in the cost f materials and labor its cost is greater than that of a year or two ago. The man who buys groceries and clothing for his family finds it necessary to pay more for these commodities than has been his necessity heretofore. It happens that the man or corporation buying materials and labor for the manufacture of electricity is in the same position, and it seems to be inevitable that while present conditions continue the man who buys electricity must find himself confronted with the operation of the same law. It costs more to produce the commodity. Therefore the purchaser of the commodity must pay more. If this commission is to measure up to its full duty in relation to the national crisis, it must take this condition into consideration." The commission then quotes the correspondence between the Secretary of the Treasury and the President.

Interest on Consumers' Deposits.—The New Jersey Board of Public Utility Commissioners, in a case affecting the Atlantic Coast Electric Light Company, says: "The board recognizes that at seasonal resorts conditions differ from those pertaining to places where the greater part of the population maintain their residences throughout the year. It may be that the rule which requires deposits by all non-property owners as a condition of supplying service is reasonable in view of the conditions under which the company operates. The record before the board is not sufficient to decide this question. It is clear, however, that a rule such as the company has adopted results in the accumulation by it of considerable sums of money available for use before service is afforded and many of the expenses incidental thereto have been incurred. This is a distinct advantage to the company, and a disadvantage to those who for the time being part with their money without receiving service equal to its value. The company does not deny that interest should be allowed, but claims that as the highest grade of interest paid by any banking institution in the county is 4 per cent, it is not reasonable to expect it to pay more. It was testified at the hearing that the company borrows money for use in its business at 5 per cent. It seems to the board that the rate of interest a bank may allow to willing depositors on money which it loans at a profit should not be accepted without limitation as the rate a public utility should allow on deposits not made voluntarily, but as a condition of supplying service. The total operating revenues of the Atlantic Coast Electric Light Company for the year 1917, as shown by its report to this board, were $231,599; operating expenses, including taxes, $201,548. The lowest sum on deposit at any time during the year was $9,281 in the month of February. In August this sum had increased to $26,578. Surely, when the company obtains in advance from its customers so material a part of the cost of supplying service, it is not unreasonable for it to pay interest at a rate equal to that it pays for money borrowed from the bank, which appears to be 5 per cent. The board recommends that this rate be allowed."

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month on the next-to-last text page.

Illinois State Association of Electrical Contractors and Dealers.—On Sept. 19 and 20 the meeting of the Illinois State Association of Electrical Contractors and Dealers will be held at Peoria.

Detroit Engineering Society.—The opening meeting of the season of the Detroit Engineering Society was held on Sept. 6. H. H. Esselstyn addressed the meeting on "the Hog Island Shipyard." On Aug. 26 the society attended a meeting called by the advisory board on fuel conservation, United States Fuel Administration, at which coal conservation as applied to industries was discussed.

A. I. E. E., Chicago Section.—The joint meeting of the Chicago Section of the American Institute of Electrical Engineers and the War Committee of the Technical Societies of Chicago will be held on Sept. 23, 1918, in Chicago. An address will be delivered by Col. P. Junkersfeld on the subject of "Emergency Construction for the War Department in the United States." The lecture will be fully illustrated by lantern slides and possibly by motion pictures.

American Bankers' Association.—The forty-fourth annual convention of the American Bankers' Association will be held at Chicago in the week beginning Sept. 23. It will be a war convention, and the various sessions will be devoted largely to addresses on topics of the day. Among the speakers who will address the convention are W. H. Vandervoort of the Root & Vandervoort Engineering Company, East Moline, Ill., whose subject will be "Relations Between Employer and Employee." Samuel Insull, president of the Commonwealth Edison Company, will discuss the effect of the war on public utility securities.

American Gear Manufacturers' Association.—An interesting program is being arranged for the semi-annual meeting of the American Gear Manufacturers' Association, which will be held at the Onondaga Hotel, Syracuse, N. Y., on Sept. 19, 20 and 21. A portion of the program has been announced as follows: "Priority," by Charles A. Otis of the Priority Committee; "What Is the Possibility of Women Becoming a Permanent Factor in the Gear Industry?" by W. H. Diefendorf; "Trade Acceptances," by C. E. Crofoot, and "The Outlook of the Steel Supply," by C. E. Stuart, secretary and treasurer of the Central Steel Company, Massillon, Ohio.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Massachusetts Rate Advance.—The Fall River (Mass.) Electric Light Company has filed notice with the Board of Gas and Electric Light Commissioners of Massachusetts of an increase in the charge for energy for lighting purposes from 9 to 10 cents per kilowatt-hour, and of energy for power from 6 to 7 cents.

Chicago Has 500,000 Telephones.—On July 30, 1918, the Chicago Telephone Company installed the five-hundred-thousandth telephone in Chicago. It was installed for Samuel Insull, chairman of the State Council of Defense of Illinois and president of the Commonwealth Edison Company, in his Council of Defense office at 120 West Adams Street.

Christmas Buying.—The Council of National Defense has issued a statement regarding the necessity of restricting Christmas giving. Among the reasons are the necessity for saving labor and material in the manufacture and sale of Christmas gifts and of saving the transportation and delivery facilities necessarily involved in the large volume of Christmas purchases. Representatives of leading industries and retail interests concerned have agreed not to increase working forces over the average prices throughout the year and not to increase normal hours in the Christmas season. Efforts will be made to confine buying, except for young children, to useful articles and to spread the buying period over October, November and December. Economy in deliveries will also be promoted.

Rate Increase in Malden, Mass.—In announcing an increase of 1 cent per kilowatt-hour, effective on Sept. 1, J. T. Day, manager Malden (Mass.) Electric Company, says in part to consumers: "It has for a long time been the established policy of this company to reduce its rates for service as rapidly as the growth of the business and increased efficiency of operations made reductions possible. Increasing cost of coal, labor and all materials entering into the manufacture and distribution of electricity makes it necessary, however, for us to increase our rates for lighting and power service. We urge our customers, wherever possible, to limit the use of electricity as much as they reasonably can and to eliminate all wasteful uses of energy. Power users, in particular, are urged to adopt every means to utilize the electric supply efficiently, thereby assisting the Fuel Administrator in his efforts to conserve the coal throughout New England."

Steps to Prevent St. Louis Strike.—Officials of the Union Electric Light & Power Company, St. Louis, have taken steps to prevent an attempt by the Brotherhood of Electrical Workers to start a strike. They telegraphed the United States government labor authorities at Washington, in reference to the request of the War Labor Board that the company withdraw its application for an injunction against officials and members of the brotherhood, that the company proposes to carry out its legal action. "Under the circumstances," said the telegram, "we cannot consent to dismiss legal action to safeguard continuity of service to important war industries and the maintenance of the present system of industrial relaions." In this connection warning has been given against tampering with the transmission lines. "Any attempt to stop the supply of electric service to this community would be disastrous," the company says. "While the average residence might subsist for awhile on candles, electric light service is a matter of life and death in many hospitals. A shutdown of long duration," the St. Louis company goes on to point out, "would shut down many industries now working at full speed on government supplies."

Pacific Coast Fuel Oil Requirements.—The demand for crude oil in 1918 is estimated at 90,000,000 bbl. as against 96,000,000 bbl. consumed in 1917. This figure has been announced by D. M. Folsom, Petroleum Administrator for the Pacific Coast, who assigns the decrease to conservation measures, the conversion of numerous industrial plants for the use of coal, wood and electricity, and the restrictions of less essential industries. This total is also the estimated total of the expected demand for 1919, 1920 and 1921. The consumption of oil for shipping industries is expected to more than double during the next three years, so that by 1921 a total consumption of 24,000,000 bbl. is expected, as against 10,440,000 bbl. during the present year. The railroads used 34,000,000 bbl. of crude oil in 1917 and the estimated consumption this year will be 32,000,000. A total of 38,000,000 bbl. in 1921 is expected. Consumption by war industries will increase, it is estimated, to 8,000,000 bbl. in 1919 as against 2,000,000 bbl. in 1917. It is expected that this consumption will drop back to 7,000,000 bbl. in 1920 and then down to 2,000,000 bbl. in 1921. For food production in 1917, 4,650,000 bbl. were required. For that purpose during the present year the estimate is 5,160,000 bbl., with an expected increase to 5,500,000 in 1919 and 1920, and 6,000,000 in 1921. In mining and smelting operations a considerable decrease is looked for during the next three years. In 1917 for these industries 7,200,000 bbl. were consumed, the estimated demand for this year being 5,200,000 bbl. In 1919 a consumption of 4,500,000 bbl. is expected, while for 1920 the estimate is 4,000,000 bbl.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies.

High-Voltage Wire Insulation.—An electric light company charged with negligence in not insulating its power lines so as to protect the traveling public may, though the statute requires them to be "properly insulated," show "that no known substance thereon will prevent the escape of electricity under high voltage," the Supreme Court of Iowa held in Wells versus Chamberlain (168 N. W. 238).

Boy Has Right to Climb Trees.—In the case of John Wilke, administrator, versus S. N. Ford, receiver, heard before the Court of Appeals of Richland County, Ohio, the facts were as follows: The Mansfield Railway, Light & Power Company's wires in Mansfield, Ohio, passed through a tree on the sidewalk, and by reason of the abrasion of the limbs the insulation had worn off the wire. A boy about eleven years old while playing climbed up in the tree and came in contact with the uninsulated part of the wire and was killed. The Court of Appeals held that the boy had a right to be in the tree and that it was the duty of the light and power company so to maintain its wires as to prevent injury therefrom, and held that the approximate cause of the boy's death was the failure of the defendant company to have the wire properly insulated and that the company was liable. Judgment of the Common Pleas Court was reversed.

Water-Power Rights of Private Concerns.—Supreme Court Judge Whitmyer of Schenectady has handed down an opinion dismissing the complaint against the state filed by the West Virginia Pulp & Paper Company of Mechanicsville, N. Y., holding in substance that the fee title to the bed of the Hudson River at the point in question did not pass under the early colonial patents, but remained and remains in the state; that while the paper company by the legislative act referred to obtained a right to construct and maintain a dam at this point with crest at elevation 67.5 Barge Canal datum, it possessed no right to maintain the flashboards on the dam, and that, in any event, whatever rights it obtained under the said legislative act were subject and subservient to the reserved right of the state to do whatever was necessary to improve the navigation of the river, without responding to the paper company in damages, and that the Barge Canal improvement was such an improvement of the navigation of the Hudson River.

R. S. Davies has been promoted to be new-business manager of the Lorain County Electric Company at Elyria, Ohio.

George H. Cook, for the past five years local manager for the Wisconsin Gas & Electric Company at Kenosha, Wis., has resigned to enter the army.

H. H. Murray has been appointed electrical engineer of the Eastern Connecticut Power Company. He was formerly employed by the General Electric Company and for six years was in charge of the electrical construction work in Barcelona, Spain.

H. C. Deffenbaugh, for the last year and a half assistant to the secretary of the Empire State Gas & Electric Association, has been commissioned first lieutentant, Corps of Engineers, United States Army, and assigned to the Searchlight Section, 56th Engineers, Washington Barracks, Washington, D. C. Prior to his connection with the association Mr. Deffenbaugh was cost engineer for the Rochester (N. Y.) Railway & Light Company, with which company he was associated since 1906.

T. F. Johnson has been promoted from superintendent of transmission and distribution of the Georgia Railway & Power Company, Atlanta, Ga., to assistant superintendent of the electrical department. Mr. Johnson was born in Savannah, Ga., in 1887 and was graduated from the Georgia School of Technology in mechanical engineering in 1908 and in electrical engineering in 1910. Since graduation he has been continuously in the employ of the former company in various positions. He is the inventor of several devices for handling live lines and for changing insulators on live lines operating on voltages as high as 110,000. Among his devices is the Johnson lamp.

P. D. Wagoner, formerly president of the General Vehicle Company, has been elected president of the Elliott-Fisher Company, Harrisburg, Pa. Mr. Wagoner was born July 24, 1876, in Somerville, N. J., and received his preparatory education in the public and high schools there. He afterward attended the Stevens School and the Stevens Institute of Technology, being graduated from the last-named institution in 1896 with the degree of mechanical engineer. After graduation he entered the students' course of the General Electric Company. After a short time he was transferred to the transformer engineering department at Lynn, Mass., where he remained until May, 1900. Thence he was sent to the company's plant at Schenectady, N. Y., where he was assigned to the office of the engineer of the supply department, specializing in transformer work. In 1901 he was delegated to organize and manage the transformer sales department. In the early part of 1908 Mr. Wagoner was transferred to the executive offices of the General Electric Company in New York City. In 1910 he was elected to the presidency of the General Vehicle Company.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

Thomas Sproule, in charge of the overhead-line construction department of the Philadelphia Electric Company, is president-elect of the Pennsylvania Electric Association. Mr. Sproule was born in Philadelphia, where he received his early education, being graduated from the Central Manual Training School. He first became employed in pattern making, but later, in February, 1895, he entered the employ of the Brush Electric Company, since merged with the Philadelphia Electric Company, as draftsman. In this connection he became particularly interested in aërial and street-lighting work, and in 1902 he was promoted to

THOMAS SPROULE

be assistant to the engineer of that department. Mr. Sproule has been a member of the overhead-line committee of the N. E. L. A. since the formation of that committee and served as its chairman two years, 1914 and 1915, during which time the handbook on overhead-line construction was written and issued by the committee.

Capt. R. H. Hastain, formerly with the sales department of the Mid-West Electric Company, Omaha, Neb., is now in France with the 317th Field Signal Battery, 76th Division. This is Captain Hastain's second time in the service. Early in 1903 he left the service of the Bell Telephone Company at Sedalia, Mo., and enlisted in the Signal Corps. He saw service in the Philippine Islands with the Signal Corps until 1909. After returning from the Philippine Islands he entered the sales department of the old Dean Electric Company. Upon his arrival in France he was promoted from first lieutenant to captain of his company.

H. A. Joslin, district manager of the Oregon Power Company at Dallas, Ore., has been appointed farm labor agent by the Dallas Commercial Club, acting for the United States Labor Commission. Mr. Joslin has also been appointed vice-president of the Chamber of Commerce.

Ward M. Burgess, vice-president and director of the Nebraska Power Company, Omaha, Neb., as a result of his conspicuous work in connection with the war savings investment, has been retained by the Treasury Department at Washington for further work of a broader nature. Mr. Burgess was appointed Nebraska War Savings Director by Secretary McAdoo in November, 1917. Under his leadership the work was thoroughly organized in Nebraska and pushed with such vigor that by the end of January Nebraska was leading all the states in per capita sales, and on March 22 a drive for pledges was held all over the state which resulted in an oversubscription of the state's quota and enormous cash sales. Nebraska's quota was a little less than $26,000,000 and as a result of the big drive in March about $33,000,000 was sold and pledged. Mr. Burgess was then called to Washington by the national committee to attempt by the same methods as those used in Nebraska to secure a similar result in other states. A special drive for pledges in June was organized and carried out all over the country. As a result of this campaign $211,000,000 was received by the Treasury during July from the sale of war savings stamps, while the total for the best previous month had been less than a third as large. The total cash received up to Aug. 14 was $590,940,834, representing stamps to the maturity value of $711,976,905. In addition to this amount actually sold, the national committee, from reports received from state directors, estimates that there are additional pledges to the amount of $850,000,000, making the total sales and pledges about $1,561,976,905, this being more than 78 per cent of the entire issue authorized for the year by Congress. A comparative statement issued by the national committee, following the national June campaign, showed total sales and pledges in Nebraska to the amount of 130 per cent of the state's quota, the next nearest state showing 109 per cent of its quota, and the lowest state showing only 26 per cent.

Obituary

Vilas A. Henderson, secretary and new-business manager of the Memphis Gas & Electric Company, died on Aug. 19 at Memphis, Tenn. Mr. Henderson was born on Aug. 16, 1879, at Princeton, Ill. He was a graduate of the electrical engineering school of the University of Nebraska and had been employed by central-station interests in the cities of Lincoln, Neb., and Denver, Col.

TRADE & MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies— Notes on Industrial Activities and Business Methods

BRIDGEPORT (CONN.) LABOR DECISION IS RENDERED

Basic Eight-Hour Day and Minimum Wage for Men and Women Established—Umpire Decides Against Changing Classification

What is probably one of the most important labor decisions that have so far been handed down by the National War Labor Board was recently made by Otto M. Eidlitz, umpire chosen by the board to decide the controversy between the managements and approximately 60,000 workers in sixty-six plants of Bridgeport, Conn. Among these plants were some engaged in producing electrical material.

The decision grants wage increases to all of the workers receiving less than 78 cents an hour and establishes a minimum wage of 42 cents an hour for all male workers skilled or unskilled, twenty-one years of age or over, and a minimum wage of 12 cents an hour for all female workers eighteen years of age or over; grants the demand of workers for the application of the basic eight-hour day in all of the manufacturing plants of Bridgeport; establishes the right of workers to bargain collectively and to join trade unions, and provides that women performing the same work as men shall receive equal pay. On the important question of classification the umpire decided against changing the method now in operation, on the ground that suddenly to order a complete readjustment of the prevailing working system would be prejudicial to the interest of the government, which is directly concerned in the output of the Bridgeport industries. With regard to classification, it was the demand of the workers in the machine shops that, in the performance of their respective duties, they be classified as toolmakers, machinists, specialists and machinists' helpers, and that minimum rates of pay be established for each of these classifications. This was a major point of difference in the controversy. The employers contended that the great variety of tasks necessary in the operation of the industries made it impossible to confine the classification within the narrow limitations demanded by the workers or to fix a flat rate of pay for workers.

In addition to the selection by the workers of committees to represent them in their dealings with the managements, the decision provided that there shall be established a local board composed of six members, three to be chosen by and to represent the workers of Bridgeport and three to be chosen by and to represent the employing companies, the function of which shall be to adjust such future differences as cannot be settled between employer and employees. The chairman of this committee is to be chosen by and to represent the Secretary of War.

Touching upon the recognition by the War Labor Board of the right to collective bargaining, the decision declares that "we have passed from the day of the individual to the day of the group, and that the will of the group shall have precedence over the will of the individual."

The decision directs the secretary of the board to appoint an examiner to supervise the application of the award.

The Bridgeport case originally was confined to a controversy between the machinists and the managements in a few of the larger plants. The entrance of the War Labor Board into the controversy presented to the other employers an opportunity to bring about the establishment of a uniform system of industrial relations applied to the whole of the community. Advantage was taken of this opportunity when the thirty-four concerns not parties to the original issue agreed voluntarily to be bound by the decision reached in the cases of the firms directly involved.

The wage increases provided for in the award are made retroactive to May 1 in certain cases, to June 26 in the case of six other plants which submitted to the board's jurisdiction on that date, and to July 1 in the cases of the thirty-four plants which voluntarily came before the board on that date. All of the companies are given until Oct. 1, 1918, to complete the back payment of wages. The award is effective for the duration of the war, except as either party may reopen the case at periods of six-month intervals for such adjustments as changed conditions may render necessary.

HANDLING GOVERNMENT ORDERS PRESENTS DIFFICULTIES

Trouble in Collecting Accounts Arises When Materials Are Shipped Without Prior Receipt of Formal Order

The jobber who is called upon by a representative of the government to supply material for war service naturally desires to meet the situation in the best possible manner. Unfortunately orders are sometimes placed orally by officers unfamiliar with business methods, and in some cases the results have been unfair to the jobber, doubtless without the least intention to work any injustice on the part of the government. Often the jobber has immediately shipped material on a war order without waiting for the formal written confirmation, or else has placed a corresponding order with the manufacturers on the strength of a telephone conversation or a personal interview with the government's representative. The pressure to get material is very great, and now and then the government's representatives "short-circuit" the jobber by issuing instructions to the manufacturer direct to ship material by means which lead to delays; the material arrives late, and when the jobber presents his bill he finds it practically out of the question to collect it because the government representative has refused to accept the shipment. In time, the jobber might collect through the courts, but the cost would be very serious. Again, a jobber not seldom receives instructions or specified conditions on the formal order which were never mentioned in the original negotiations preceding the purchase of material or its shipment, and it has happened that unless he meets these later and new requirements, he can make his collections only with great delay.

There is a belief in the trade that the jobber is justified in refusing to ship material, after a few such experiences, except upon receipt of the formal order from the government. There is often a very great gap between the official placing an order and the final authority who approves the jobber's bills for payment, and a certain amount of self-protection must be had if the jobber is going to keep in business and serve the government efficiently. A clear understanding between all parties concerned as to what is wanted, when and how it is to be supplied, and upon what terms of payment, is an important thing at this time. Immediate shipments of material from jobbers' stocks on the receipt of verbal orders are probably necessary in many cases, but for the future successful relations of the government, the manufacturers and the jobbers, it is vitally important that the delay between placing the order by word of mouth and its formal confirmation be reduced to the absolute minimum.

THE WEEK
IN TRADE

GENERALLY speaking, the volume of sales is still being maintained. Nevertheless, the position of the government relative to articles made from iron, steel, copper, brass and rubber, which include almost all electrical supplies, is beginning to make itself felt with the trade. Inquiries are beginning to fall off, and in a very large number of lines a decreasing business must necessarily follow. The jobbing industry here and there is already beginning to feel this. To a certain extent, however, the trade will welcome a less feverish market.

Wire and conduit appear to be scarcer than ever, with little outlook for an early improvement. The second-hand market appears to be slowing up in the East in small apparatus.

Labor is still very unsettled and is now the greatest handicap of all to production. Wages continue to increase.

Reports from the agricultural centers are not favorable. The corn crop will be small, as will cotton and to a less degree potatoes. Wheat appears to be in a better condition than was previously reported.

On the eve of the fourth Liberty loan drive collections appear to be showing no tendency to drop off.

NEW YORK

Jobbers' stocks are reported in fair condition in the majority of cases, but uncertainty is apparent as to the future supply of some materials. Small sizes of copper wire especially are practically non-obtainable at this time. Wire manufacturers report that 95 per cent of their efforts are being directed directly to war work, and it is believed that 98 per cent of their output will shortly be given over to government work.

The procurement branch No. 3, section 3A, of the hardware and metals division of the United States Army Quartermasters' Corps announces purchases and contracts to be made this week of sixty-two individual motor-driven sewing and binding machines and sixty induction motors with ratings of less than 3-hp.

After the close of the fourth Liberty loan drive, some relief is looked for on the building situation in and around New York. It is expected that more help in the way of fuel and material is to be obtained to take care of the necessary construction requirements. The fact that the government has been taking over certain large buildings will make considerable construction necessary. In the seven months ended July 31 building construction under government curtailment in New York metropolitan districts within a radius of 100 miles from New York (excluding Philadelphia) has shown a decline of 36.6 per cent, and at the same time the demand for all kinds of space, residential, commercial, storage and industrial, has been stimulated abnormally.

WIRE.—Uncertain deliveries, especially in small sizes of wire, are causing no small concern among jobbers. The Signal Corps has changed its requirements from 10,000 miles to 65,000 miles of No. 17 seven-strand copper wire per month for outpost wire and is at the present time using some coppered steel wire. This leaves the telephone and telegraph companies without their usual copper-wire requirements and they have been required to use No. 14 hard-drawn steel wire. Insufficient capacity in stranding and binding machines is causing the trouble, and until production catches up with the government requirements jobbers will continue to have trouble getting small sizes of wire.

SECOND-HAND MACHINERY.—The demand for apparatus below 75 hp. has fallen off considerably of late. This is due to concerns being stocked up on small sizes and the gradual elimination of less essential industries. So far the lack of demand has not affected the prices of this type of machinery. The increased demand for large apparatus can be supplied with 10 per cent of orders according to several dealers.

POLE-LINE HARDWARE.—Public utilities have started placing fair-sized orders in this vicinity. The supply and stocks are reported good.

ELECTRIC APPLIANCES.—Generally speaking, the stock of household appliances in this vicinity is fair at present, although the increasing demand cannot be met. Industrial appliances appear to be low, however. Department stores are buying only in small quantities and infrequently and are not carrying stocks nearly as large as formerly. Manufacturers are eliminating certain types of vacuum cleaners as ordered by the War Industries Board.

CONDUIT.—Stocks are reported light with small chance of obtaining additional supplies in this district. Considerable time is entailed in obtaining priority orders for the purchase of this material and the railroad classification priority order for transportation.

CHICAGO

To prepare a workable plan of speedy industrial and commercial reconstruction which will be ready to operate immediately at the close of the war, a group of Chicago business associates, headed by the War Service Editorial Conference of the Chicago Trade Press Association, is planning a national convention, to be held probably on Dec. 5 and 6 in Chicago. Business men and government officials of national and international repute will speak on raw materials, credits, reconstructive merchandising, reconstruction of commodity prices, what to do with our increased production, government and business, and international relations.

In bringing nearer the answer to the question "What will be the business situation after the war?" this meeting is expected to be of real service to industry and commerce. "Prepare for reconstruction" is to be the slogan for the work.

CREDITS.—The Chicago Clearing House is expected to follow the action of the New York Clearing House in reducing the minimum charge on acceptances from out of town.

GRAPHIC METERS.—Production is so much graver a problem than sales that one prominent Middle Western manufacturer has turned over the office end of his business to his subordinates and is spending all of his time at the factory.

LIGHTING REFLECTORS.—Effective Sept. 3, the National X-Ray Reflector Company increased its prices on lighting reflectors about 10 per cent. This increase is the more interesting because the company's plan of discounts has been also changed. It now conforms with the so-called Goodwin plan, affording protection to all branches of the trade.

ROTARY CONVERTERS.—Small rotary converters are in such demand by the government for battery-charging work that one Chicago manufacturer has the converter department of his business 100 per cent on war work. His difficulty with materials may be appreciated by the fact that last week he had a shipment of steel by express from Pittsburgh.

HEATING DEVICES.—The Edison Electric Appliance Company is preparing to advertise to the public the fact that it advocates that old electrical appliances be used as long as it is possible to make them work before buying new ones. By this means the company is discouraging the waste of raw materials and fuel and at the same time urging the adoption of the electrical way of cooking and heating where, and only where, the national interest will be served.

WASHING MACHINES.—Another Chicago manufacturer has raised his prices about 10 per cent.

BOSTON

Trade continues extremely active. Collections do not show great change from week to week, but it is not thought that money will be much easier for the present, in face of the forthcoming Liberty loan campaign and of the prospective revenue law. Deliveries are still running long on many lines of supplies and equipment, owing partly to railroad congestion and partly to factories being oversold. The labor market is decidedly unsettled on account of war demands and the unknown effect of the next draft upon industry. New England jobbers are maintaining fairly good stocks, but there is a decided tendency toward shortage conditions in labor-saving appliances. Electrical contractors are doing very little new wiring outside of war-plant jobs, but some house wiring is in sight in connection with the building of homes for shipyard and munitions plant workers.

FIXTURES.—Stocks are unusually large and well assorted. While business is at a lower ebb than in normal times, there is some buying of fixtures for residential refurnishing. Prices are holding up well.

WIRE AND CABLE.—Government business continues brisk. A Rhode Island plant received an order a few days ago for 4000 miles of No. 18 twin-conductor field service wire. This looks like a large order until one realizes that it is only part of a total order of 200,000 miles of twin-conductor (400,000 miles single wire) just placed for the army and distributed among plants in different sections of the country.

CONDUIT.—Stocks are running lower. Pipe is hard to obtain, and deliveries are very long despite priority orders. Representative houses are short on all sizes.

WASHING MACHINES.—The demand continues very heavy, and jobbers are having difficulty in filling orders.

MOTORS.—Small sizes are still in vigorous demand. Stocks are in better shape than for several months, all things considered. Prices show little change.

VACUUM CLEANERS.—A brisk demand is being encountered with the opening of the fall season. Some extra war work is being handled, and one plant in Massachusetts is turning out stretchers and wigwag staffs in addition to its regular lines. Price tendencies are upward.

AUTOMOBILE SUPPLIES.—The prohibition of Sunday pleasure riding in order to save gasoline has affected the retail dealer somewhat, and the jobber will soon note a difference in trade if the curtailment is continued. Local agencies are finding it somewhat hard to obtain batteries in sufficient quantity.

LAMPS.—The situation is very satisfactory as regards meeting current demands, and there is little fear of a shortage arising this fall considering the efforts the manufacturers have made to enlarge their facilities.

INDUSTRIAL ELECTRICAL TRUCKS.—Consistent development of the field for this equipment has been rewarded, and a good deal of business is now seeking local agencies. Less canvassing of the territory for new orders is at present required. Competition is keen and deliveries are rather spotty.

ELECTRICALLY DRIVEN REFRIGERATING EQUIPMENT.—Business has been excellent this summer. One prominent manufacturer reported that the volume of work done has never been exceeded with the exception of last year. Military and naval hospitals have been buying on a considerable scale, and some cantonment sales have been made. Labor is scarcer and the cost of motors and pipe coils trends upward. Erecting mechanics of draft age are hard to procure. There is little or no stocking up at factories, and with the government orders being handled the manufacturers are about as active as their facilities make possible.

FUSES.—The demand is very large for industrial and government service.

MOLDED INSULATION.—Factories are oversold and could double their production if the necessary machinery and labor could be obtained. A good deal of this insulation is going into war supplies, notably magnetos for army trucks, aëroplanes, etc. No tendency toward lower prices is to be seen.

ATLANTA

The volume of transactions in the electrical field continues satisfactory, with the possible exception of steel products. Although government takings of steel goods and allied lines are fairly heavy, distributers have noticed a decrease in sales during the past week. Jobbers expect this line to sag off slowly owing to the Priorities Committee's ruling. The fact that electrical supplies have been put on the preferential list for essential work will tend to maintain a substantial market for these goods. No effect is visible at this time of the orders curtailing the output of certain appliances.

While there are continued reports of labor shortage on account of the draft, this shortage is due to the many thousand workmen employed at shipyards, cantonments and other government work in the Southeast.

The Emergency Fleet Corporation had decided on an expenditure of $1,250,000 for building a 10,000-ton dry dock with accompanying facilities at New Orleans, employing 400 men. The St. Petersburgh (Fla.) Maritime & Construction Company has been recently organized. A large plant for the manufacture of silicon alloy is contemplated by the Chattanooga (Tenn.) Electro-Metals Company. Eight camps in the Southeast will be equipped with electrically operated laundries costing approximately $160,000 each.

Although light showers have fallen on the watersheds serving the water-power plants of the Georgia Railway & Power Company, the drought remains unbroken, and the lack of power is so serious that the Building Managers' Association of Atlanta has agreed to curtail elevator service 50 per cent. All hydroelectric customers and retail users of 25 hp. and above have discontinued power service, with th exception of the very essential industries and plants on 100 per cent war work.

CONDUIT.—It is becoming more difficult each day to secure conduit. A few weeks ago reasonable quantities could be obtained by making proper affidavits, but the latest indications are that domestic stock may be commandeered for government use. For those who can produce a class AA or A classification the problem is not so serious. Jobbers report stocks as being lower at present than they have been in a long time.

STEEL-ARMORED CABLE.—There appears to be a moderate stock of this material on hand.

PANELBOARDS.—The demand for panelboards remains steady. The volume of business transacted is, however, handled mostly through government channels.

SEATTLE—PORTLAND

Business remains steady with the usual heavy sales volumes to shipyards and allied industrials. There were few large orders during the past week, but total sales were a shade heavier. This applied particularly to the Seattle field. Seattle jobbers report that power apparatus the past week moved faster, while Portland states that the activity was confined largely to motor sales of 50 hp. or less. This size is going rapidly. Power apparatus is coming through only on government orders, but Northwestern jobbers are fairly successful in securing stock. An important feature in Seattle is the threatened shortage of rubber-covered wire. The demand is very heavy and the shortage is becoming daily more acute in all sizes. Permission is being sought to use wire on knobs in downtown structures under erection owing to present scarcity of conduit. Much difficulty is being experienced in securing conduit for other essential building.

The Pacific Coast Steel Company, Portland, has placed an order for an 800-hp., 2200-volt induction motor for a plant under construction. Six months' delivery is prom-

ised. Specifications are expected in Portland shortly for a proposed spruce division cut-up plant to be operated in Toledo, Ore.

Jobbers report that large supplies of motors, transformers and other electrical supplies are on hand at the present time. They also state that very little effect is felt thus far by jobbers and manufacturers relative to placing of electrical goods on the preferred list. Fears of an oil-fuel shortage in the Northwest are gradually being dissipated as a result of well-sounded assurances from California. To date the More Homes Bureau, Seattle, has secured pledges for the erection of nearly 4000 dwellings before Jan. 1. The aggregate value of houses pledged is more than $87,000,000. More buildings in prospect for Camp Lewis include officers' quarters, addition to hospital and less important structures. It is reported that $750,000 additional will be added to the housing fund for accommodations of war workers at the Puget Sound Navy Yard, Bremerton. Portland authorities state that activity and demand for homes has never been better. The labor situation is daily becoming more complicated. There is said to be a shortage of 20,000 men in Seattle and the various Puget Sound cities alone.

FARM-LIGHTING PLANTS.—These are beginning to move, the demand during the past two weeks having been highly satisfactory. No campaigns are being conducted, except demonstrations at fairs. Stocks on hand are ample for present demand.

DOMESTIC APPLIANCES.—Sales are holding up well, but stocks are increasingly hard to secure. Washing machines are easily the leader.

LAMPS.—Portland jobbers report that lamp stocks are gradually improving, although there is still a real shortage in miniature sizes. Orders for 60-watt "mazdas" have exceeded stocks, but replacement stocks are now in transit from the Oakland factory. Shipments of 400-watt floodlighting lamps are slow. Seattle jobbers state that the shortage in small sizes has been overcome, but large sizes are hard to obtain. The demand for larger sizes has exceeded supply. With the approach of winter sales are showing a noticeable increase in shipbuilding and industrial centers, floodlamps experiencing a healthy movement.

COLLECTIONS.—The War Savings Stamp drive and the approaching fourth Liberty loan campaign are having no bad effect on collections, which are reported very good.

SAN FRANCISCO

There have been an unusually large number of bids received by local jobbers during this past week, presaging a winter drive on new factories, extensions and alterations. It is expected that the new draft registration will take a very large number of electrical men to assist in essential industries.

The United States government announces the construction of a one-hundred-and-fifty-thousand-dollar laundry at Camp Kearny, stating that nearly $6,000,000 has already been expended for such laundries in all the United States camps. A repair shop for the Quartermasters' Department is also building at Camp Kearny. A meat-packing plant at Modesto, a fruit-packing house at Redlands, a bean warehouse at Santa Maria, fish canneries near Los Angeles, schools and hospitals in Oakland, a state warehouse for Phoenix, Ariz., and a million-dollar construction job at Clyde, near Bay Point, where three, four and five room cottages are to be built, are items of new construction that are announced.

RANGES.—It is possible that electric ranges will be installed in the industrial cottage scheme near Bay Point referred to above, where 350 cottages are contemplated, and a number of firms are figuring on the installation. The power company is not yet selected. The only other competing fuel would necessitate the construction of a 13-mile line of gas mains.

FARM-LIGHTING SETS.—The Western Electric, Lally and Delco plants report big sales. These firms were all represented in attractive booths at the California State Fair, held recently in Sacramento and largely attended by farmers and orchardists. The increasing number of sales has rendered local stocks of 32-volt appliances for them necessary. Stocks and deliveries are good.

HAND LANTERNS.—Electric hand lanterns, especially the kind using two dry batteries of standard size, are in demand. An almost incalculable amount of damage has been done by agitators and pro-Germans, and protective patrolling of orchards, vineyards and wheat fields is necessary.

SPARK COILS.—Sales of gas engines for pumping plants and as prime movers for 32-volt plants have produced a big demand for spark coils. All of the gas-engine factories have been very busy. Prices have remained constant during the year.

INSULATING MATERIALS.—Further drastic advances of from 15 to 25 per cent in mica and tapes are reported, with uncertain deliveries. The latest impetus to the sale of this material is the requirement of essential industry orders or priority certificates on sales of all new motors, and repaired motors are in great demand.

METAL MARKET SITUATION

Tin Continues to Fall Off £2 per Ton in English Market—Producers Controlling Lead Supply

Copper during the past week has shown no change. The demand is still large and production is off owing to labor trouble. A tremendous shortage of rolled brass has come to light, and manufacturers must now limit their sales to essential industries.

Tin continues to fall in price in the English market about £2 per ton daily. This is taken to be in preparation for a lower fixed government price. Recent cables would lead buyers to expect £300 per ton as the fixed price. Present quotations are ruling at about £40 higher. Already the Inter-Allied Tin Executive Committee has established sittings in London.

A report from Washington on Wednesday was to the effect that two-thirds of the pig-tin supply of the world is to be received by the United States under a pooling arrangement made at a recent conference in London between representatives of the United States, Great Britain, France and Italy. Shipments to be made to this country will be consigned to the American Iron and Steel Institute, which will distribute the material at regulated prices to consumers.

Lead is now controlled by the producers' committee, through which all pig lead will be cleared or allotted. Scrap metals show no change.

NEW YORK METAL MARKET PRICES

	Sept. 3	Sept. 10
Copper:	£ s d	£ s d
London, standard spot	122 0 0	122 0 0
	Cents per Pound	Cents per Pound
Prime Lake	Govt. price 26.00	Govt. price 26.00
Electrolytic	Govt. price 26.00	Govt. price 26.00
Casting	Govt. price 26.00	Govt. price 26.00
Wire base	29.25	29.25
Lead, trust price	8.05	8.05
Antimony	14.12½	14.00
Nickel, ingot	40.00	40.00
Sheet zinc, f.o.b. smelter	15.00	15.70
Spelter, spot	9.50	9.70
Tin, Chinese *	No quotations	No quotations
Aluminum, 98 to 99 per cent	Govt. price †33.10	Govt. price †33.10

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	23.50 to 24.50	23.50 to 24.50
Brass, heavy	14.50 to 15.00	14.50 to 15.00
Brass, light	11.50 to 12.25	11.50 to 12.25
Lead, heavy	7.50 to 7.75	7.50 to 7.75
Zinc, old scrap	6.50 to 6.75	6.50 to 6.75

* No Straits offering. † In 50-ton lots or more; carload, 33.10 cents per lb. 1-ton to 14-ton lots, 33.20 cents per lb.

Current Prices of Electrical Supplies

New York and Chicago Quotations

THE prices quoted are those prevailing in standard packages of specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of this week. They are in all cases the net prices or prices subject to discounts from standard lists of contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges on account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit. Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East and Middle West, their nearness to the sources of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers. Price variations may be due to difference in grade of products of different manufacturers, to local conditions, or to both.

ARMORED CONDUCTOR, FLEXIBLE STEEL

Single-Conductor

B. & S. Size	List Per 1000 Ft.
No. 14 solid	$61.00
No. 12 solid	71.00
No. 10 solid	90.00
No. 8 solid	106.00
No. 6 solid	145.00
No. 10 stranded	95.00
No. 8 stranded	115.00
No. 6 stranded	160.00
No. 4 stranded	205.00
No. 2 stranded	266.00
No. 1 stranded	315.00

Twin-Conductor

No. 14 solid	104.00
No. 12 solid	135.00
No. 10 solid	185.00
No. 8 stranded	235.00
No. 6 stranded	370.00
No. 4 stranded	575.00

NET PRICE AND DISCOUNT PER 1000 FT.—NEW YORK

Single-Conductor

	No. 14 Solid
Less than coil	List
Coil to 1000 ft	12½%—57.25
	No. 12 Solid
Less than coil	List
Coil to 1000 ft	12½%—66.75

Twin-Conductor

	No. 14 Solid
Less than coil	List
Coil to 1000 ft	12½%—97.75
	No. 12 Solid
Less than coil	List
Coil to 1000 ft	12½%—126.80

DISCOUNT—CHICAGO

Single-Conductor

	No. 14 Solid
Less than coil	+20% to List
Coil to 1000 ft	5% to 15%
	No. 12 Solid
Less than coil	+20% to List
Coil to 1000 ft	5% to 15%

Twin-Conductor

	No. 14 Solid
Less than coil	+5% to $80.00
Coil to 1000 ft	5% to 75.00
	No. 12 Solid
Less than coil	+20% to +5%
Coil to 1000 ft	5%

ATTACHMENT PLUGS

List ranges from $0.22 to $0.30 each.
Standard packages from 100 to 250.

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	12%
1/5 to std. pkg	20%
Std. pkg	44%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	+20% to 12%
1/5 to std. pkg	List to 20%
Std. pkg	25% to 44%

BATTERIES, DRY

NEW YORK

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.40	$0.40
12 to 50	.35—.36	.35—.36
50 to barrel	.31—.32	.32—.33
Barrel lots	.28—.289	.29—.299

BATTERIES, DRY—Continued

CHICAGO

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.40	$0.40
12 to 50	.35	.35
50 to barrel	.319 to .322	.329 to .33
Barrel lots	.289 to .292	.299 to .302

CONDUIT, METALLIC FLEXIBLE

Size, In.	Ft. per Coil	List per 100 Ft.
⅜	250	$5.00
½	250	7.50
⅝	100	10.00
¾	50	13.00
1	50	21.00
1¼	50	26.00
1½	25–50	35.00
2	25–50	45.00
2½	25–50	52.00

NET PER 1000 FT.—NEW YORK

	Less Than Coil	Coil to 1000 Ft.
⅜-in. single strip	$75.00	$63.75—69.75
⅜-in. double strip	75.00—82.50	72.00—75.00
½-in. single strip	100.00	85.00—93.00
½-in. double strip	100.00—110.00	96.00—100.00

NET PER 1000 FT.—CHICAGO

	Less Than Coil	Coil to 1000 Ft.
⅜-in. single strip	$75.00	$63.75 to $64.25
⅜-in. double strip	78.25 to $78.75	71.25
½-in. single strip	100.00	75.00 to 85.00
½-in. double strip	105.00	93.00 to 95.00

CONDUIT, NON-METALLIC FLEXIBLE

Size, In.	List per Foot	Size, In.	List per Foot
⅜	$0.05½	1	$0.25
½	.06	1¼	.33
⅝	.09	1½	.40
¾	.12	1¾	.47
⅞	.15	2	.55
1	.18	2¼	.65

NET PER 1000 FT.—NEW YORK

	Less Than $15 List	$15 to $60 List	$60 to $150 List
⅜-in.—	25.00–55.00	24.00–24.45	21.50–23.00
½-in.—	30.00–60.00	27.00–28.00	23.50–26.00

NET PER 1000 FT.—CHICAGO

	Less Than $15 List	$15 to $60 List	$60 to $150 List
⅜-in.—	$60.00	$30.00	$26.50
½-in.—	65.00	33.50	29.00

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON

Card No. 40

Size, In.	Conduit, List per Foot
⅛	$0.08½
¼	.08½
⅜	.08½
½	.11½
¾	.17
1	.23
1¼	.27½
1½	.37½
2	.58½
2½	.76½
3	

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON—Continued

Size, In.	Couplings, List	Elbows, List
⅛	$0.05	$0.19
¼	.06	.19
⅜	.07	.19
½	.10	.25
¾	.13	.37
1	.17	.45
1¼	.21	.50
1½	.28	1.10
2	.40	1.80
2½	.60	4.80
3		

DISCOUNT—NEW YORK

	¼ in. to ½ in.	¾ in. to 3 in.
Less than 2500 lb.	7% to 12%	9% to 14%
2500 to 5000 lb.	10% to 15%	12% to 17%

(For galvanized deduct six points from above discounts.)

DISCOUNT—CHICAGO

	¼ to ½ In.	¾ to 3 In.
Less than 2500 lb.	1.5% to 6.8%	3.5% to 8.8%
2500 to 5000 lb.	4.5 to 10.7%	6.5% to 12.7%

(For galvanized deduct six points from above discounts.)

FLATIRONS

NEW YORK

List price	$5.00 to $6.00
Discount	30%

CHICAGO

List price	$6.00 to $7.00
Discount	25% to 30%

FUSES, INCLOSED

250-Volt	Std. Pkg.	List
3-amp. to 30-amp.	100	$0.25
35-amp. to 60-amp.	100	.35
65-amp. to 100-amp.	50	.90
110-amp. to 200-amp.	25	2.00
225-amp. to 400-amp.	25	3.60
450-amp. to 600-amp.	10	5.50
600-Volt		
3-amp. to 30-amp.	100	$0.40
35-amp. to 60-amp.	100	.60
65-amp. to 100-amp.	50	1.50
110-amp. to 200-amp.	25	2.50
225-amp. to 400-amp.	25	5.50
450-amp. to 600-amp.	10	8.00

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	30%
1/5 to std. pkg.	41%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	30% to 31%
1/5 to std. pkg.	40% to 41%

FUSE PLUGS

3-Amp. to 30-Amp.

NEW YORK

	Per 100 Net
Less than 1/5 std. pkg.	$5.00 to $5.50
1/5 to std. pkg.	4.50 to 4.75

Standard packages, 500. List, each $0.07

CHICAGO

	Per 100 Net
Less than 1/5 std. pkg.	$7.00
1/5 to std. pkg.	5.75

Standard packages, 500. List, each, $0.07

LAMPS, MAZDA OR TUNGSTEN

105 to 125 Volts

Regular, Clear:	Std. Pkg.	List, Each
10 to 40-watt—B	100	$0.30
60-watt—B	100	.35
100-watt—B	24	.70
75-watt—C	50	.70
100-watt—C	24	1.10
200-watt—C	24	2.20
300-watt—C	24	3.25
Round Bulbs, 3½-in., Frosted:		
15-watt—G 25	50	.53
25-watt—G 25	50	.55
40-watt—G 25	50	.55
Round Bulbs, 3½-in., Frosted:		
60-watt—G 30	24	.77
Round Bulbs, 4½-in., Frosted:		
100-watt—G 35	24	1.10

DISCOUNT—NEW YORK

Less than std. pkg.	List
Std. pkg.	10%

DISCOUNT—CHICAGO

Less than std. pkg.	List
Std. pkg.	10%

LAMP CORD

Cotton-Covered, Type C, No. 18

NEW YORK

	Per 1000 Ft. Net
Less than coil (250 ft.)	$20.20—$35.90
Coil to 1000 ft.	26.95— 27.18

CHICAGO

	Per 1000 Ft. Net
Less than coil (250 ft.)	$35.00
Coil to 1000 ft.	26.00

LAMP GUARDS, WIRE

Standard packages from 50 to 150

NEW YORK

Net per 100	$24.00

CHICAGO

Net per 100	$21.75 to $30.00

OUTLET BOXES

Nos.	List, Per 100
101—A, A1½, 4 S.C., 6200, 320	$30.00
102—B.A., 6200, S.E., 300, A.X., 1½, 4 S.	30.00
103—C.A., 9, 4R, B 1½	25.00
106—F.A., 7, C.S., 1½, 3 R	20.00

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $10.00 list	25% to 33%	20% to 27%
$10.00 to $50.00 list	42%	37%

DISCOUNT—CHICAGO

	Black	Glavanized
Less than $10.00 list	30% to 40%	20% to 35%
$10.00 to $50.00 list	40% to 50%	30% to 45%

PIPE FITTINGS

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

PORCELAIN CLEATS—UNGLAZED

Two and Three Wire

NEW YORK

	Per 1000 Net
Less than 1/5 std. pkg.	$21.00 to $38.00
1/5 to std. pkg.	17.85 to 19.00

Standard package, 2200. List per 1000, $20.

CHICAGO

	Per 1000 Net
Less than 1/5 std. pkg.	$16.80
1/5 to std. pkg.	15.80

Standard package, 2200. List per 1000, $20.00

PORCELAIN KNOBS

NEW YORK

Per 1000 Net	Std. Pkg. 3500	Std. Pkg. 4000
	5½ N.C.—Solid Nail-it—N.C.	
Less than 1/5 std. pkg.	$16.00 to $20.20	$32.00
1/5 to std. pkg.	13.60 to 15.60	27.20

CHICAGO

Per 1000 Net.	Std. Pkg. 3500.	Std. Pkg. 4000
	5½ N.C.—Solid Nail-it—N.C.	
Less than 1/5 std. pkg.	$11.70 to $24.00	$33.85
1/5 to std. pkg.	10.15 to 20.06	26.60

SOCKETS AND RECEPTACLES

	Std. Pkg.	List
½-in. cap key and push sockets	500	$0.33
½-in. cap keyless socket	500	.30
½-in. cap pull socket	250	.60

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	+10% to 10%
1/5 to std. pkg.	5% to 8%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	List
1/5 std. pkg.	16⅔%

SWITCHES, KNIFE

250-Volt, Front Connections, No Fuse

High Grade:	
30-amp. S. P. S. T.	$0.80
60-amp. S. P. S. T.	1.20
100-amp. S. P. S. T.	2.25
200-amp. S. P. S. T.	3.48
300-amp. S. P. S. T.	5.34
30-amp. D. P. S. T.	1.20
60-amp. D. P. S. T.	1.78
100-amp. D. P. S. T.	3.38
200-amp. D. P. S. T.	5.20
300-amp. D. P. S. T.	8.00
30-amp. 3 P. S. T.	1.80
60-amp. 3 P. S. T.	2.68
100-amp. 3 P. S. T.	5.08
200-amp. 3 P. S. T.	7.80
300-amp. 3 P. S. T.	12.00
Low Grade:	
30-amp. S. P. S. T.	$0.42
60-amp. S. P. S. T.	.74
100-amp. S. P. S. T.	1.50
200-amp. S. P. S. T.	2.70
30-amp. D. P. S. T.	.68
60-amp. D. P. S. T.	1.22
100-amp. D. P. S. T.	2.50
200-amp. D. P. S. T.	4.50
30-amp. 3 P. S. T.	1.02
60-amp. 3 P. S. T.	1.84
100-amp. 3 P. S. T.	3.76
200-amp. 3 P. S. T.	6.76

DISCOUNT—NEW YORK

	High Grade
Less than $10 list	+5% to Net
$10 to $25 list	11% to 15%
$25 to $50 list	14% to 20%
	Low Grade
Less than $10 list	5% to 10%
$10 to $25 list	16% to 25%
$15 to $50 list	24% to 28%

DISCOUNT—CHICAGO

	High Grade
Less than $10 list	+15% to +5%
$10 to $25 list	List to 11%
$25 to $50 list	5% to 14%
	Low Grade
Less than $10 list	+5% to 5%
$10 to $25 list	8% to 16%
$25 to $50 list	16% to 24%

SWITCHES, SNAP AND FLUSH

5-Amp. and 10-Amp., 125-Volt Snap Switches

	Std. Pkg.	List
5-amp. single-pole	250	$0.28
5-amp. single-pole, ind.	250	.32
10-amp. single-pole	100	.48
10-amp. single-pole, ind.	100	.54
5-amp. three-point	100	.54
10-amp. three-point	50	.76
10-amp., 250-volt, D. P.	100	.66

10-Amp., 250-Volt Push-Button Switches

	Std. Pkg.	List
10-amp. single-pole	100	$0.45
10-amp. three-way	50	.70
10-amp. double-pole	50	.70

SWITCHES, SNAP AND FLUSH—Continued

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	+10%
1/5 to std. pkg.	5% to 8%
Std. pkg.	23% to 25%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	+20% to 10%
1/5 to std. pkg.	List to 16⅔%
Std. pkg.	25%

SWITCH BOXES, SECTIONAL CONDUIT

Union and Similar—	List Each
No. 155	$0.34
No. 160	.60

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $2.00 list	Net to 40%	Net to 30%
$2.00 to $10.00 list	10% to 50%	5% to 40%
$10.00 to $50.00 list	20% to 60%	10% to 52%

DISCOUNT—CHICAGO

	Galvanized	Black
Less than $2.00 list	25% to 40%	20% to 30%
$2.00 to $10.00 list	25% to 50%	20% to 40%
$10.00 to $50.00 list	25% to 64%	20% to 52%

TOASTERS, UPRIGHT

NEW YORK

List price	$6.00
Discount	30%

CHICAGO

List price	$6.35 to $7.00
Discount	25% to 30%

WIRE ANNUNCIATOR

NEW YORK

	Per Lb. Net
No. 18, less than full spools	$0.434—$0.51
No. 18, full spools	.384— .49

CHICAGO

	Per Lb. Net
No. 18, less than full spools	$0.65 to $0.69
No. 18, full spools	.55 to .575

WIRE, RUBBER-COVERED, N. C.

Solid-Conductor, Single-Braid

NEW YORK

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
14	$15.00–$20.00	$12.75–$15.00	–$11.25
12	21.29– 27.10	19.35– 23.20	$17.05– 17.42
10	29.70– 37.80	27.00– 32.40	23.75– 24.30
8	41.91– 53.35	38.10– 45.70	33.35– 34.29
6	60.30– 84.40	54.27– 72.35	51.55– 53.05

CHICAGO

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 2500 Ft.	2500 to 5000 Ft.
14	$21.00–$22.00	$16.00–$22.00	$13.25–$16.50
12	28.70– 29.46	28.70– 29.46	24.50– 25.54
10	40.10– 41.10	40.10– 41.10	34.23– 34.62
8	56.50– 57.90	48.23– 57.90	41.34– 50.18
6	85.31– 91.18	77.84– 85.31	66.72– 72.27

WIRE, WEATHERPROOF

Solid-Conductor, Triple-Braid, Size 4/0 to 3 Inc.

NEW YORK

	Per 100 Lb. Net
Less than 25 lb	$37.75 to $38.40
25 to 50 lb	36.40 to 37.75
50 to 100 lb	32.40 to 36.75

CHICAGO

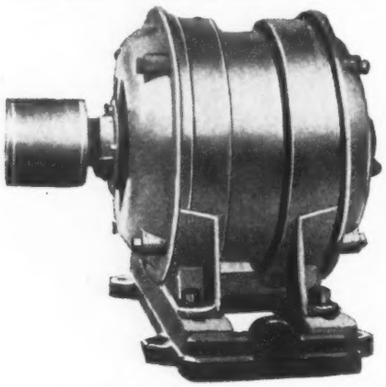
	Per 100 Lb. Net
Less than 25 lb	$37.00 to $39.72
25 to 50 lb	36.00 to 38.72
50 to 100 lb	35.00 to 37.72

NEW APPARATUS & APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Ball-Bearing Alternating-Current Motor

By the use of ball bearings in its alternating-current motors the Stamford Electric & Manufacturing Company, Stamford, Conn., has been able to decrease the maintenance. This is



SMALL AIR GAP BETTERS THE OPERATION OF MOTOR

due to the use of a small air gap. Also the rubbing of rotor and stator after the motor has been in use some time is said to be eliminated. Motors that are mounted in various positions will operate satisfactorily owing to the bearing construction, says the manufacturer. This rugged motor, it is claimed, stands the severest service conditions and is so constructed that dirt, dust, lint, etc., cannot enter the motor readily and clog the bearings.

Safety-First Induction Motor Panel

In manufacturing operations safety and efficiency are usually so related that an improvement in either must effect an improvement in the other. The panel illustrated herewith promotes safety because it is adapted particularly to the control of alternating-current feeder or motor circuits in capacities up to 300 amp. and 2500 volts.

This unit comprises a General Electric type FK-20 oil circuit breaker mounted on a pedestal constructed of steel plates and angle iron, the former holding the latter in position and serving as mountings for the apparatus in the interior of the pedestal. The compartment immediately beneath the breaker and surrounded by the steel plates is used for mounting the potential and current transformers. The space above the switch serves as a housing for the disconnecting switch, and also provides a location for either voltmeter or ammeter or both when desirable. Other instruments such as watt-hour meters, etc., may be mounted on the sheet-steel front of the panel. The back of the pedestal is also a sheet-steel plate removable to allow access to the interior.

Back of the instruments in the interior of the housing are spring contacts which make contact with the instrument studs, so that after removing the holding screws the instruments can be removed from their support without disconnecting the leads. When the instruments are replaced, the connections to them are made automatically. The instrument resistances are mounted behind the instruments.

The oil circuit breaker is operated in the usual manner by an iron handle from the front. Automatic protection is obtained by two series overload coils

FOR CONTROL OF ALTERNATING-CURRENT FEEDER OR MOTOR CIRCUITS

provided with dashpot time-limit trips. The under-voltage release weight hangs in the small space in the panel. The oil circuit breaker can be operated only when the disconnecting switch is closed.

The disconnecting switch is operated from the front of the pedestal by a removable handle so interlocked with the oil circuit breaker that the disconnecting switch can be operated only when the breaker is open.

The breaker can thus be cut out of service at any time when open, and can be inspected or repaired without danger. The oil tank cannot be taken off the breaker, nor can the cover over the disconnecting switch be removed unless the disconnecting switch is open.

The disconnecting switch and the oil circuit breaker can both be locked open by removing the disconnecting switch handle. This handle can be removed or attached only when the disconnecting switch is open.

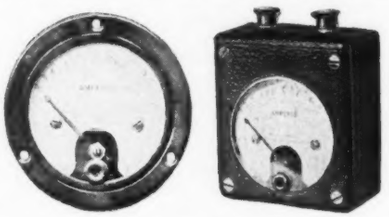
Meters for Wireless and High-Frequency Work

A high-grade hot-wire measuring instrument designed particularly for wireless and other high-frequency work, depending for its operation upon the expansion of a metal strip which is heated by the current to be measured, has been developed by the Westinghouse Electric & Manufacturing Company. The slight sag in this conducting strip is magnified several hundred times on the scale by means of a combination of wires and a deflecting spring.

The conducting strip is made of special non-corrosive material. The separating posts, according to the maker, have the same temperature coefficient of expansion as the conducting strip, so that the changes in room temperature do not cause an error in the reading of the instrument.

The instruments are furnished in two forms, for flush mounting and portable. Similar instruments for switchboard mounting are also supplied.

The flush-mounting form, known as type EH, is of the round open-face type. The face is 3 in. (7.6 cm.) in diameter, and the diameter outside the flange is 3¾ in. (9.5 cm.). It has a black "rubberoid" case and rim, with white dial. The portable form, known as type PH, is mounted in a morocco-leather-covered wooden case with heavy glass over the dial. The case is



SWITCHBOARD AND PORTABLE METERS FOR HIGH-FREQUENCY WORK

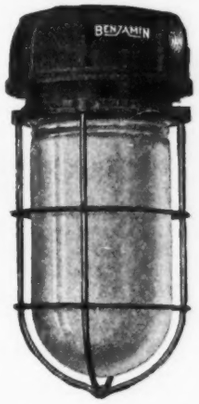
3¾ in. by 4⅜ in. by 2 in. (9.5 cm. by 11.1 cm. by 5 cm.).

The scale plate is made of metal, and the scale subtends an arc of 90 deg., being 2⅜ in. (6 cm.) long. The type EH meters have a guaranteed accuracy of 2 per cent, while the type PH, with hand-marked scale, can be expected to

show an accuracy within 1 per cent of full scale. Standard meters are for 1, 2 and 5 amp.

Watertight Deck or Ceiling Fixture

Extreme ruggedness for use on shipboard, where the service demands not only that it be watertight but that it withstand the shock and stress of severe weather, is claimed to be obtained in a watertight marine fixture with screw globe and protecting guard recently placed upon the market by the Benjamin Electric Manufacturing Company, 806 West Washington Boulevard, Chicago, Ill. The electrical parts are heavy, the socket base being made of molded insulating material. The gaskets are standard merchant marine material. Globes are furnished with the navy standard thread and both in rough and colored glass.



WILL WITHSTAND THE SHOCK AND STRESS OF SEVERE WEATHER

Side-Outlet Current Taps

A short time ago the Cutler-Hammer Manufacturing Company of Milwaukee placed on the market a new porcelain side-outlet "standard" current tap, having an Edison lamp shell and screw base. The side outlet, which is made with both multiple and series connections, has two parallel protected contacts. The arrangement of these contacts and the attaching cap employed conforms to the "standard" for plugs and receptacles adopted by six leading electrical manufacturers who by this move made the attaching devices interchangeable. The "C-H" current tap is furnished either with or without a "Standard" cap. The cap is made of "Thermoplax" insulation—a heat-resisting material, which has ample strength to permit riveting of the contact blades. The contact blades remain in permanent alignment and the appearance of the knurled finish is not spoiled by use.

CONTACT BLOCKS REMAIN IN PERFECT ALIGNMENT

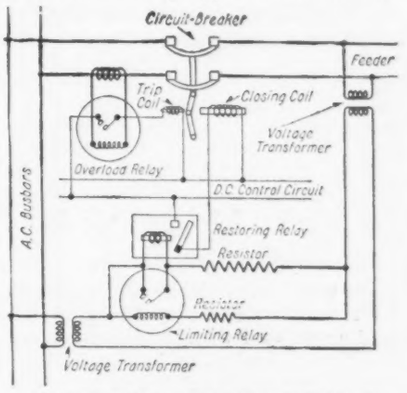
Radiant Air Heater with Cone-Shaped Element

Efficient reflection of the heat rays is claimed for a "radiant air heater" manufactured by the Estate Stove Company, Hamilton, Ohio. This heater has a cone-shaped element the heat rays from which are reflected by a highly polished coppered reflector. This reflector has a swiveled connection which allows the focus of the reflector to be altered in any direction. The element is protected from injury by a substantial wire guard, as shown in the accompanying illustration. This "Estate" heater is regularly equipped with 7 ft. (2.1 m.) of cable, ready to be attached to any lamp socket. It enables the user to have heat almost instantly in any location. The heater is said to be portable, ornamental and effective and especially adapted for use in the living room, bedroom, bathroom or office. The dimensions of this heater are 17 in. (43 cm.) in height, 8 in. (20.3 cm.) diameter of base and 9½ in. (24.1 cm.) for the reflector proper.

PORTABLE, ORNAMENTAL AND EFFECTIVE RADIANT AIR HEATER

Service-Restoring Relay System

Service-restoring relay systems have been developed by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., which will minimize interruptions caused by transient short circuits that clear themselves as soon as the circuit breaker has been opened, thus permitting the feeders to be put back into service immediately. If the circuit breaker is reclosed automatically within a second after the transient trouble has occurred, the service will be restored in time to prevent induction motors from stalling. The service-restoring relay system performs this operation in the shortest possible time, according to the maker, and thus reduces all disturbances to a minimum and improves the lighting service. Should a permanent defect occur, the system will allow the breaker to remain open until the defect is cleared. A schematic diagram of operation of this system is shown in the accompanying illustration. Any type of overload relay may be employed to trip the circuit breaker. A voltage transformer on the feeder outside the circuit breaker is connected so that its potential opposes that of another voltage transformer connected to the busbars. The restoring relay, which is similar to a magnet switch, is connected in series with these two voltage transformers. Before a short circuit occurs both voltage transformers are subjected to the same conditions so that no current will flow through the restoring relay, but when a short circuit occurs and the circuit breaker has been opened by the overload relay current will be forced by the busbar transformer into the feeder transformer through the restoring relay. The restoring relay will then close its contacts, which in turn will close the circuit breaker.



CONNECTIONS OF SERVICE-RESTORING RELAY SYSTEM

In case of a permanent defect on the feeder, the restoring relay would continue to close the circuit breaker when it was opened by the defect. To prevent this, a limiting relay, similar to the Westinghouse type "CV" overvoltage relay, but equipped with weaker spring and heavier damping magnets so that its action is sluggish, is connected in such a manner that while the circuit breaker is open it is subjected to the same difference of potential that is operating the restoring relay. Each time the circuit breaker opens the limiting relay contacts begin to close, and, owing to its heavy damping, they do not return to the starting point immediately after the circuit breaker is closed. After the circuit breaker has opened and closed a predetermined number of times, this relay closes its contacts, thus short-circuiting the restoring relay and preventing further operation.

When this system is installed at substations having no attendant, it is of-

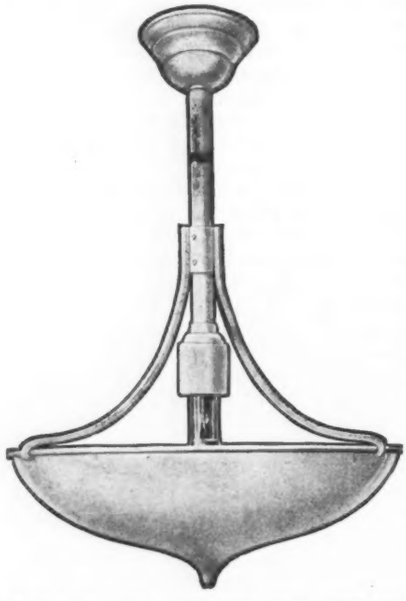
ten found advisable to have an indicating device that will show when the service has been momentarily interrupted. For this purpose a graphic ammeter is placed in the direct-current control circuit of the circuit breaker, which indicates whenever the breaker has been closed by automatic means. A special control switch is used which contains one dragging contact so arranged that when the circuit breaker is tripped manually the switch automatically opens the circuit between the two voltage transformers.

This relay is said to decrease power interruptions and thus economizes the time of switchboard and other station attendants, or in some cases releases some of these men for other purposes.

Indirect-Lighting Unit for Industrial Uses

For use where it is desirable to sacrifice the higher efficiency of the direct-lighting unit for the shadowless quality of indirect illumination in offices, drafting rooms, textile mills and hospitals, the Holophane Glass Company, Inc., 340 Madison Avenue, New York City, has recently put on the market an indirect-lighting unit.

The bowl is 20 in. (50.8 cm.) in diameter and is drawn from seamless steel covered both inside and out with a white porcelain enamel of high reflecting properties. The contour of the bowl, which has been designed to conform to a theoretical curve, is said to produce an extremely high-efficiency illumination. It is so constructed that the lamp may be left in the socket when cleaning the bowl without danger of



BOWL MAY BE ADJUSTED FOR SEVERAL SIZES OF LAMPS

breaking the lamp tip. The bowl-holding device is made not unlike the principle used in ice hooks which tightens the grip of the holder as the weight of the bowl or other downward pull increases. The bowl can be removed for cleaning and replaced with one hand in a second's time, say the manufacturers. The holder is finished in white enamel to match the bowl. Any type of tungsten or gas-filled lamp from 75 to 1000 watts can be used in this unit because by a slight adjustment to the holder the correct lamp position is always maintained.

Brass-Covered Pull-Switch Rosettes

Specifications for modern industrial housing usually show a preference for brass-covered devices for concealed work suitable for attaching directly to a ceiling or outlet box. Such units are decorative and economical, as they can take the place of a more or less elaborate fixture. In order to extend the line of keyless receptacles, pull receptacles and plain rosettes with brass covers now on the market, the Arrow Electric Company, Hartford, Conn., is manufacturing a pull-switch rosette shown in the accompanying illustration. This rosette, the manufacturer

BRASS-COVERED ROSETTE TAKES THE PLACE OF ELABORATE FIXTURE

claims, is compact and strong, the cover being firmly attached to the rosette by screws. It is designed for loop wiring, and each rosette is equipped with a long cord and the porcelain is recessed to allow room for a fixture loop.

Storage Battery with Five-Year Guarantee

Storage batteries, to give the best service, must have plates with a surface which prevents washing down, according to the Monarch Storage Battery Company of 113 Campau Avenue, S. W., Grand Rapids, Mich. This firm is manufacturing a type of battery for automobile starting and lighting and for farm-lighting outfits which has a thick plate with a hard surface but with sufficient porosity to allow it to take the charge easily. The jars are of sufficient size to permit enough space between the bottom of the jar and the bottom of the plate. They also have ample headroom and are arranged to contain a quantity of electrolyte which makes frequent refilling unnecessary. These large jars also give the appearance of a massive outfit and show up to good advantage, especially where the sale is being made as a replacement proposition in connection with an already installed farm-lighting plant.

Key and Pull-Chain Sockets

Sockets which are particularly adaptable for fixture work are now being manufactured by the Duncan Electrical Company, Ltd., 1665 St. James Street, Montreal, Canada. This is accomplished by means of a narrow groove in the neck of the cap which permits a wide turning of the socket even after it is firmly fitted on the stem. The holding catches of the shell and cap are so arranged as to warrant a maximum of strength and rigidity. This socket is

SOCKET ADAPTED FOR FIXTURE WORK

rated at 660 watts, has a snap cap, and is of quick make-and-break socket mechanism. This company also manufactures the pull-chain socket illustrated, which has the same shell and locking device used on the key socket. All sockets and receptacle shells are furnished in brushed brass, unless otherwise specified.

Reflectors for Floodlight Projector

Three reflectors have been developed by the National X-Ray Reflector Company, Chicago, for use in its No. 60 floodlight projector, described on page 648 of the March 23, 1918, issue of the

THESE REFLECTORS MEET A NUMBER OF REQUIREMENTS FOR FLOOD LIGHTING

ELECTRICAL WORLD. The No. 845 reflector illustrated at the top is corrugated and gives a wide diffused beam of light when used with this projector. The halftone in the middle shows the

No. 835 reflector, which produces a beam of light of varying spread of from 12 deg. to 30 deg. The reflector at the bottom is listed as No. 840 and produces an extremely concentrated beam.

Ball-Bearing Electric Washer

Speed and efficiency are two of the features claimed for a washing machine that is being manufactured by the Knoll Manufacturing Company, 124 Maple Street, Reading, Pa. The wringer of this machine swings to three positions and has an 11-in. (27.9-cm.) roll.

MOTOR MOUNTED UNDERNEATH STAND OF WASHING MACHINE

The washer is driven by a ¼-hp. motor mounted underneath the machine. The tub can be lifted off the stand and stored away to keep from drying out if necessary.

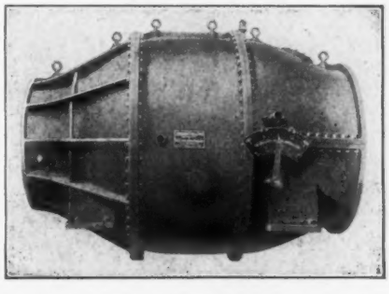
Electrically Controlled Hydraulic Valve

Electrical operation by means of two small 110-volt direct-current solenoids without the use of motors or limit switches is one of the main features of a hydraulic valve that is being manufactured by the Larner-Johnson Valve & Engineering Company, Philadelphia. The valve consists essentially of a circular body containing an internal concentric cylinder supported by ribs and closed at one end in which there is a differential plunger with a conical nose which is seated inside the neck of the valve body. The differential plunger divides the internal plunger into two operating chambers, a central or closing chamber and an annular or opening chamber. The plunger is closed by admitting pressure from the pipe line to the closing chamber and exhausting the opening chamber to the atmosphere. It is opened by reversing this operation. The supply and discharge of pressure to and from the operating chambers are governed by a control valve outside the valve body.

The adaptability of the Johnson valve to remote electrical control makes it especially suitable for use in pumping plants, distributing stations and filtration plants where a number of valves are required to operate from a central switchboard. A battery of these valves under electrical control is very convenient.

The main and branch pipe lines are diagrammed in outline on the switchboard, together with the positions of the various valves. Each valve is represented by a rotary switch with an opaque diaphragm having a transparent slot illuminated by an incandescent bulb at the rear. When the slot stands lengthwise with the pipe the switch is set to open the valve, and when it stands crosswise it is set to close. When a valve is standing in either position the slot of the corresponding switch is illuminated and the operator can see at a glance the position of every valve in the station. When the switch is turned to a new position the light immediately goes out and does not light up again until the valve has followed the switch, or, in other words, has performed the operation for which the switch is set. Thus, if the switch is turned from shut to open, the light goes out and does not light up again until the valve is wide open. At this point the circuit to the solenoid which operates the valve is automatically broken. The switch is therefore not only a switch but a position indicator and a trouble detector as well.

If the light goes out and after an interval lights up again, the operator knows that the valve has performed



BATTERY OF VALVES MAY BE OPERATED FROM CENTRAL SWITCHBOARD

its function. If it does not light up again, he knows something is out of order. If the slots of all the switches on the board are illuminated, the operator knows not only the position of all the valves in the station but also that they are all in working order.

The electrical control is simple. A 110-volt direct current is used, and the only parts other than the cables are two small solenoids which operate the control valve, two spring push-buttons on the indicator mechanism of the valve, and the control switch for the switchboard.

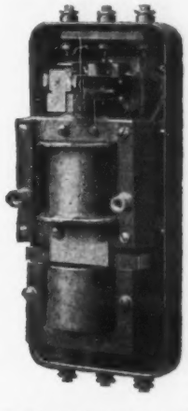
Rugged Lightning Arrester

Graded selective discharge is claimed to be one of the features of a lightning arrester manufactured by the Bowie Switch Company, Nevada Bank Building, San Francisco, Cal. This is accomplished by means of a bow-shaped arrester which also assures the permanence of the gap and thus makes it suitable for isolated locations as well as for attendant stations. The discharge point is independent of the frequency, which is said to insure the operation at any time. Other features of the lightning arrester are free path to ground, inductance minimized, all parts visible and open to inspection, operation unaffected by changes in temperature, no daily attention required, no housing necessary, ample radiation for repeated or severe discharge, and efficiency and reliability.

Transfer Relay for Alternating Current

Although it is designed for use with Westinghouse type CO and CR relays, the type BT transfer relay recently developed by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., can be applied to any make of circuit-closing relay of similar characteristics. This breaker operates solely through the current transformer and the relays, and when there is no fault on the line the trip coil of the breaker is mechanically and electrically isolated from the circuit, thus, according to the makers, avoiding possibility of tripping due to imperfection in the relay contacts ordinarily shunting the trip coil.

The relay consists of two series coils, an upper or operating coil and a lower or holding coil. The holding coil holds down the armature core until a third coil, wound on the same magnetic circuit and known as the releasing coil, is short-circuited by the protective relay. The releasing coil acts as a secondary of a transformer, and when short-circuited a current flows through it, demagnetizing the core. The holding coil therefore allows the operating coil to raise the core which operates the transfer switch, thus closing the trip-



NO CHANCE FOR RELAY TO TRIP BECAUSE OF IMPERFECTION

coil circuit. The transfer switch and other current-carrying parts of the relay are designed to carry 5 amp. continuously, but during times of short circuit it is said that the switch may be called on to handle as much as 100 amp. or 200 amp. Only one trip coil is required for use on a polyphase circuit, but if the breaker is equipped with as many trip coils as there are relays, it is advisable to connect each trip coil to its corresponding relay.

Trade Notes

Government Contracts

The following contracts are reported as having been placed by the various departments of the government for electrical supplies:

HARDWARE AND METALS DIVISION, QUARTERMASTERS' DEPARTMENT.—Aug. 12 and 13, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., electric irons, electric motor.

BUREAU OF AIRCRAFT PRODUCTION.—Aug. 3, Simplex Wire & Cable Company, Boston, Mass., 3000 miles field wire. Aug. 6, Splitdorf Electrical Company, Newark, N. J., 40 sets Dixie D800 magnetos and spare parts to be used in connection with all Hispano-Suiza engines, using one right-hand and one left-hand magneto. Aug. 14, Collieries Supply & Equipment Company, Philadelphia, Pa., 48 electrical engineers' chests. Aug. 20, Splitdorf Electrical Company, Newark, N. J., magneto parts.

NAVY DEPARTMENT, BUREAU OF SUPPLIES AND ACCOUNTS.—Aug. 12, American Electrical Heater Copmany, Detroit, Mich., electric glue pots; Cutler-Hammer Manufacturing Company, New York City, door switches. Aug. 13, Willard Storage Battery Company, Cleveland, Ohio, batteries; Taylor Instruments Company, Rochester, N. Y., battery sets; U. S. Light & Heat Corporation, Niagara Falls, N. Y., storage batteries; Philadelphia Storage Battery Company, Philadelphia, Pa., storage batteries. Aug. 14, Dayton Engineering Laboratory, Dayton, Ohio, lighting plants; American Conduit Manufacturing Company, New Kingston, Pa., conduit steel; Snyder Electrical Heating Company, Cambridge, Mass., electrically heated clothing.

GENERAL ENGINEER DEPOT.—Aug. 9, U. S. Rubber Company, New York City, conductor cables; Aug. 10, General Electric Company, Schenectady, N. Y., spares for motor; Western Electric Company, New York City, stage cable. Aug. 13, Acme Wire Company, New Haven, Conn., "enamelite" copper wires; General Electric Company, Schenectady, N. Y., crane protective panels, searchlights, dark-room lamps; National Carbon Company, Cleveland, Ohio, searchlight carbons; Cutler-Hammer Manufacturing Company, New York City, battery switches; Western Electric Company, New York City, ball recording sets; Safety Insulated Wire Company, New York City, rubber-insulated cable; National Machinery & Wrecking Company, Cleveland, Ohio, motor-generator sets; Power Equipment Company, Chicago, Ill., motor-generator sets. Aug. 14, Evansville Battery Corporation, Boston, Mass., batteries. Aug. 15, Cooper Hewitt Electric Company, Hoboken, N. J., mercury-vapor lamps; General Electric Company, Schenectady, N. Y., motors. Aug. 16, Western Electric Company, New York City, switching sets. Aug. 19, Sperry Gyroscope Company, Brooklyn, N. Y., searchlights.

ACCEPTANCES.—The Guaranty Trust Company, New York City, has recently issued a booklet entitled "Acceptance" dealing with trade acceptances.

EFFECT OF WAR ON GLASS INDUSTRY.—Tariff Information Series No. 5 under title "The Glass Industry as Affected by the War" has just been published. Certain parts of the volume deal with lighting glassware.

ROBBINS & MYERS ON EIGHT-HOUR DAY.—Beginning Sept. 3, the Robbins & Myers Company, Springfield, Ohio, placed its plant on an eight-hour-day basis. Employees wil work the same length of time as formerly, but will receive overtime for time in excess of eight hours.

ELECTRICAL IMPORTS INTO CHINA.—The imports of electrical goods into China during 1916 and 1917 are reported by Consul-General Thomas Sammons as follows: Electrical materials and fittings, 1916, $2,842,372; 1917, $4,107,788; telephone and telegraph materials, 1916, $506,209; 1917, $662,501. It might be noted that the export of all electrical goods from the United States to China was $415,107 for the year ended June 30, 1916, and $1,125,072 for the year ended June 30, 1917. Included in these figures are telegraph and telephone material to the amount of $15,685 for the former year and $131,312 for the latter.

THE INDUSTRIAL EMPLOYMENT OF WOMEN.—The September issue of the *Westinghouse Electric News*, published by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is devoted largely to the employment of women in the different departments of the company.

ACCEPTANCES.—"How the Merchant Can Use Acceptances" is the title of a pamphlet issued by Bernhard Scholle & Company, 14 Wall Street, New York. An illustration of how these acceptances can be used is shown and the advantages of their use and the law involved are stated. Forms are produced and various letters of credit and acceptance agreements are shown.

ORDER TOTALING 45,000 KW.—The Westinghouse Electric & Manufacturing Company has been awarded contracts for three 15,000-kw. generators for a generating plant which will cost approximately $5,000,000 to erect. This plant will operate in connection with the government ordnance plant now being built in Neville Island. The contracts were awarded by the United States Steel Corporation, which acted for the United States government.

ARROW ELECTRIC COMPANY STRONG IN WAR SERVICE WORK.—Patriotism runs high at the factory of the Arrow Electric Company, Hartford, Conn. Fifty-three of the 600 employees of the company are in the army or navy, and one of these, Sebastiano Barbari, of the plating department, has made the supreme sacrifice for the cause of liberty. Besides enlisting on his own account this gallant young soldier induced no less than twenty-three of his countrymen to don uniforms. At the Arrow factory about two-thirds of the employees are young women and Red Cross work is being pushed with enthusiasm and sustained interest. The company's manager, Edward R. Grier, has set apart a "war room" in the office section in which all sorts of war activities center, and where weekly evening meetings are held in the interest of Red Cross and other war work. This room is equipped with motor-operated sewing machines, a large circular table, comfortable chairs, and a victrola, and is decorated with flags and photographs of war interest, including portraits of employees in the national service and a bulletin board carrying letters from boys at the front clippings, etc., of special note. This company has an enviable record in its contribution to war causes. In the first three Liberty Loans the company and its employees subscribed to $116,000 worth of bonds, nine rallies being held in this interest. The company prepared a float and used it in one of the later Liberty loan campaigns. Substantial contributions have been given to all the important war funds, employees and company alike taking part in these good works. The Red Cross chapter at the factory has adopted two French orphans and an older boy. Entertainments have been given to raise money for Knights of Columbus and other funds, and one of the veterans of General Pershing's army, on a trip to America for instruction purposes, recently addressed the girls. The welfare work of the company is being "tied in" closely with its war activities. A large percentage of the production of the Arrow company goes into the government service sooner or later, so that both in working hours and in periods ordinarily devoted to relaxation the staff and the employees in general are working hard to help win the war.

THE PREST-O-LITE COMPANY, Indianapolis, Ind., is planning for the erection of a new plant on property recently acquired on Colgate Avenue, Buffalo, N. Y., to comprise four one-story buildings for charging and other operations.

MAZDA LAMP WAR WINDOW DISPLAYS.—E. F. Newkirk, who is in charge of the window display service of the Edison Lamp Works of the General Electric Company at Harrison, N. J., has been appointed chairman of the committee on window displays for the Mazda lamp industries. The work of this committee will be carried on in coöperation with the national war service committee on window displays, the purpose being to supply all agents and distributers of Mazda lamps with patriotic window trimming material in furtherance of the government's efforts in the various war activities. Most Mazda lamp merchants have made some effort individually along these lines, but with a chairman in charge who will coöperate with them, this work can now be carried out more effectively.

REGULATION GOVERNING THE APPLICATION FOR AND ISSUANCE OF EXPORT LICENSES.—Effective Sept. 20, 1918, licenses may be granted by the War Trade Board only upon application of the consignor and only to corporations, residents, foreign partnerships with a member who is resident, foreign corporations actually maintaining in any state, territory or possession of the United States or in the District of Columbia an established branch or agency for the regular transaction of business, any foreign government, the traffic executive of Great Britain, France, Italy or the Consul for Belgium, or any official firm or corporation appointed by any department or agency of the United States government to act in its behalf. Applications for export licenses and supplemental information sheets and any other supplementary documents or letters relating thereto will be considered by the War Trade Board only when filed by such corporations, firms or individuals and only when signed in ink by a duly authorized person.

MADAGASCAR MARKET FOR ELECTRICAL GOODS.—Consul James G. Carter makes the following report on Madagascar as a market for electrical goods: "Only two electrical plants have been installed thus far in Madagascar. These are: L'Energie Industrielle, Réseau de Madagascar, for lighting the town of Tananarive, the capital, and for supplying power to industrial motors, European headquarters, 94 Rue St. Lazare, Paris, France; Barriquand & Orsini, Majunga, Madagascar. The latter plant is also used for lighting the town of Majunga. There are no tramway companies in Madagascar. The published customs statistics do not specify the quantities of electrical material imported into Madagascar, but I have been able to obtain from the local customs authorities figures giving the total quantities of dynamo armatures and detached parts, including all classes of electrical apparatus, as follows, for the past five years: 1913, 1658 lb.; 1914, 9243 lb.; 1915, 13,788 lb.; 1916, 34,092 lb.; 1917, 2752 lb. Although the statistics do not specify the various classes of electrical material imported, the above figures would appear to include principally material used for lighting purposes in Tananarive and Majunga, and for use in connection with 100 or more industrial motors in operation, principally in these two towns."

THE LAKEWOOD ENGINEERING COMPANY announces the opening of new offices in Chicago, in the Lumber Exchange Building.

THE BOSTON ECONOMY LAMP DIVISION, National Lamp Works of General Electric Company, announces that its new permanent address is 43 Hospital Street, Providence, R. I.

THOMAS A. EDISON, INC., West Orange, N. J., has appointed W. Stephens, 10 Fifth Avenue, New York, representative of the company in connection with incorporation interests.

THE ELECTRIC FURNACE COMPANY, Alliance, Ohio, has opened an office at Park Row, New York City. Dwight Miller, formerly of the Society for Electrical Development, is manager.

THE NATIONAL INDIA RUBBER COMPANY, Bristol, R. I., has announced the appointment of William E. Barker as general sales manager of the wire division of the United States Rubber Company.

WARREN C. DRAKE, who for the past twelve years has been connected with the stoker-engineering department of the Westinghouse Electric Manufacturing Company, New York, has entered into partnership wth H. S. Sleicher, and has opened an office in New York, under the firm name of Sleicher & Drake, for the handling of power-plant equipment.

CLARENCE B. HARLOW, who has been sales engineer for several years for the Benjamin Electric Manufacturing Company, Chicago, has taken charge of the entire sales work for the central district in addition to his former duties in connection with industrial and marine signaling apparatus. Mr. Harlow takes the place of G. B. Weber, to whom an extended leave of absence has been granted.

THE BOOTH-HALL COMPANY, Chicago, electric furnace builder and metallurgist, has moved its sales and administrative offices from 565 West Washington Boulevard to 2309 Archer Avenue, where only the engineering and construction departments have heretofore been located. By this change all departments of the business are combined and the furnaces in course of construction are at all times under the inspection of the officials of the company.

THE SQUARE D COMPANY, Detroit, Mich., manufacturer of safety switches, has found it necessary to open a district office in Chicago in order to cope with the big increase in the volume of business. E. A. Printz, who has represented the company in Illinois for some time, is in charge, his office being at No. 1303 Manhattan Building. W. E. Wollgamott, former city electrician of Peoria, and T. C. Walsh, lately of the Electric Appliance Company, Chicago, are associated with Mr. Printz.

THE ILLINOIS TESTING LABORATORIES, formerly at 565 West Washington Boulevard, Chicago, have moved to larger quarters at 9 South Clinton Street. This move was necessitated by the increased volume of business in repairing and testing electrical instruments. The firm specializes in meter and instrument testing and repairing, inspection of electrical material, electrical and experimental development work, motor, generator, transformer and power-plant testing and general consulting practice. J. A. Obermaier is in charge.

THE BELDEN MANUFACTURING COMPANY, Twenty-third Street and Western Avenue, Chicago, in order to overcome delays of L. C. L. freight deliveries from Chicago to Eastern customers and to meet the government's restrictions on L. C. L. shipments, has opened a warehouse and distributing station at Metuchen, N. J. This warehouse is in charge of S. C. Schenck, Eastern manager of the company, and a small emergency stock of all insulations and sizes of magnet wire will be carried for immediate or urgent shipment. Shipments from this stock will be billed f.o.b. Metuchen at an advance of ¾ cent a pound over the Chicago price. It is also the intention of the company, so far as possible, to pack shipments from Chicago for Eastern customers in its cars from Chicago to Metuchen, to be reshipped from there. The freight will be prepaid through to destination and an additional charge made on the invoice equivalent to the L. C. L. rate from Chicago to destination. However, if shipments are desired direct from Chicago, they will be made on request. All orders for magnet wire hereafter should be mailed to the Belden Manufacturing Company, Metuchen, N. J.

Trade Publications

ELECTRIC HEATERS.—The Willis Manufacturing Company, Cleveland, Ohio, has issued a folder describing and telling the uses of its Torid portable electric heater.

ORNAMENTAL LAMP.—The Beardslee Chandelier Manufacturing Company, 216 South Jefferson Street, Chicago, has issued a circular giving advantages and uses of its ornamental service lamp.

ARC-WELDING OUTFIT.—The Electric Arc Cutting & Welding Company, 222 Halsey Street, Newark, N. J., has issued a circular giving advantages and uses of its alternating-current electric arc cutter.

ELECTRIC WASHING MACHINE.—The guarantee of the United Engine Company, Lansing, Mich., is made one of the features of the striking bulletin on motor-driven and engine-driven washers issued by this company.

FARM-LIGHTING PLANTS. — The United Engine Company, Lansing, Mich., has issued an attractive colored broadside, illustrating and describing its electric farm-lighting plant and many small power-driven devices for farm use.

ELECTRIC WASHING MACHINE.—The Grinnell Washing Machine Company, Grinnell, Iowa, has issued an envelope stuffer describing and illustrating in attractive colors the Laundry Queen washing machine with copper tub and swinging wringer top.

ELECTRIC WASHING MACHINE.—A folder issued by the Maytag Company, Newton, Iowa, is designed in such colors and of such a size that it is suitable for a window display poster. It features the convenience and economy of Maytag motor-driven washers.

FARM-LIGHTING PLANTS. — "Mor-Lite" is the title of a bulletin on the self-starting, self-stopping farm-lighting plants of Fairbanks, Morse & Company. The bulletin gives an attractive picture of a cross-section of the plant which adequately indicates its features.

PUMPS.—The Viking Pump Company of Cedar Falls, Iowa, has issued an illustrated catalog showing pumps of many sizes and for a variety of uses, ranging from small pumps such as are used on ½-in. pipe for vacuum heating plants with motor drive to large pumps for pumping oil and water.

POWER-PLANT SPECIALTIES.—Governors, stop valves, reducing valves, back-pressure valves, balanced-lever valves, float valves, tank controller and other governors and regulating devices for pumps, as well as other power-house specialties, are described and illustrated in a catalog issued by the Fisher Governor Company of Marshalltown, Iowa.

ELECTRIC RANGES.—"Fifteen War-Time Cooking Suggestions" are contained in a bulletin describing Acorn electric ranges, manufactured by the Rathbone-Sard Electric Company, Albany, N. Y. These cooking suggestions were formulated by Alice Bradley, who is an authority on cooking. Copies of this bulletin will be sent by the company on request.

FIRE DETECTERS.—Automatic fire detecters are described in bulletin No. 5 issued by the Relic Equipment Corporation, fire alarm division, 52 Vanderbilt Avenue, New York City. The manufacturers claim that these detecters are built on an entirely new system which works on the principle of expansion of air in a small chamber. The expansion of the air where needed closes an electrical contact which gives an alarm on an electric bell or annunciator or both.

DISCUSSION OF FUEL LOSSES.—The H. W. Johns-Manville Company of New York City has issued a comprehensive booklet on "Fuel Waste in the Power Plant." The bulletin discusses the subjects of where to look for fuel losses and how to reduce and improve power-plant efficiency. It lists certain common but preventable causes of fuel wastage which can be corrected by the use of Johns-Manville or similiar material. The book urges that those in authority in the power plants make personal inspections in the boiler and engine rooms and of distributing pipe lines, adopt proved methods of saving wherever consistent, and see that plant engineers, firemen and operatives receive proper incentives for saving coal and adequate means of achieving the saving. The booklet is divided into four parts, which are headed as follows: "Preventable Losses in the Boiler Room," "Preventable Losses from Steam Pipes," "Preventable Losses in the Engine Room" and "Preventable Losses in Factory Buildings." Under the first section air leakage in boiler settings, door frames, boiler walls and blow-off piping is discussed and methods of detecting it are given. The heat radiation of steam pipes is discussed in detail, and specifications of thickness of insulation for different steam temperatures and pressures are given. A table is produced showing the loss due to steam leakage in pipes and pipe flanges. Excessive packing friction is discussed as a preventable loss in the engine room. Curves showing the value of electric energy consumed by an electrically driven triplex pump during a period of one year with different kinds of packing are reproduced. Radiation, steam-trap losses and outdoor distributing lines are also treated under this section. The form tabulating data when testing steam pipes to determine whether or not the trap leaks steam is shown in detail.

New Incorporations

THE BIG INDIAN POWER COMPANY of Marshallvile, Ga., has been incorpated with a capital stock of $30,000 by H. A. and J. J. Murphy and F. M. Mullino.

THE CHARLESTON (S. C.) ELECTRIC SERVICE COMPANY has been incorporated with a capital stock of $20,000 by L. A. Edwards and Augustine T. Smythe.

THE BLOCK ENGINEERING & STORAGE BATTERY COMPANY of Cincinnati, Ohio, has been chartered with a capital stock of $3000 by Ralph Block and others.

THE PEABODY BATTERY & STARTER COMPANY of Muskogee, Okla., has been incorporated with a capital stock of $7,500 by A. D. Peabody, S. O. Wood and F. H. Geben.

THE O. K. LIGHT & POWER COMPANY of Hardtner, Kan., has been incorporated with a capital stock of $25,000 by J. H. Hudson of Caprion; G. B. Darling and I. C. Vaniman of Hardtner.

THE SEMINOLE PUBLIC SERVICE COMPANY of Shawnee, Okla., has been incorporated by George A. Henshaw, A. Carey Hough of Oklahoma City, and W. A. Bacher, of Chicago, Ill. The company is capitalized at $100,000.

THE H. G. FERGUSON COMPANY, 6523 Euclid Avenue, Cleveland, Ohio, has been organized to do general engineering and construction work, specializing on shops, factories and power houses. H. G. Ferguson, formerly secretary of the Austin Company of Cleveland, is president.

THE ELECTRIC APPLIANCE COMPANY of Bellaire, Ohio, has been incorporated by S. J. Watterson, N. F. Yoho, William F. Watterson, C. W. Dickens and W. H. Reitz, all of Bellaire. The company is capitalized at $10,000 and proposes to deal in and sell electrical appliances.

A. P. MUNNING & COMPANY, 202 Emmet Street, Newark, N. J., has been incorporated by Julian Gregory, 84 Carleton Street, East Orange, and John G. Daniel, 40 Clinton Street, Brooklyn, N. Y. The company is capitalized at $500,000 and proposes to manufacture electrical machinery and equipment.

THE AJAX ELECTRIC SPECIALTY COMPANY, 1408 Morgan Street, St. Louis, Mo., has been incorporated with a capital stock of $10,000 to manufacture flashlights, telephones and plural plug sockets. The officers are: Ernest Alschuler, president and manager; J. S. Cumings, vice-president; Oscar Walters, secretary.

LES MINOTERES ELECTRIQUES DE METABETCHOUAN, LTD., of Metabetchouan, Que., has been incorporated by A. Tremblay, E. Gagne, O. Tremblay and others. The company is capitalized at $99,900 and proposes to generate electricity for lamps, heat and motors, and to manufacture electrical machinery and equipment.

THE CHATTANOOGA ELECTRO-METALS COMPANY, Chattanooga, Tenn., has been organized with a capital stock of $200,000 to manufacture silicon alloy. The officers are: Paul J. Kruesi, president and treasurer; N. Thayer Montague, vice-president and secretary; G. L. Davidson, second vice-president and manager, and Arthur Raymo, general superintendent.

New England States

BRISTOL MILLS, ME.—The new electric generating plant of the Lincoln County Power Company has been put into operation. At present a 100-kw. machine is being operated. Orders have been placed for a 250-kw. generating unit. A duplicate transmission line is now being erected from Bristol Mills to Boothbay Harbor, which when completed will enable the company to supply power from either Damariscotta Mills or Bristol Mills in Boothbay Harbor. Improvements and repairs will be made to the old transmission line upon completion of the new line.

QUINCY, MASS.—Contract has been awarded to the Andrews Electric Company of Brockton for wiring the twenty-one large dormitories and additional buildings in process of construction for the government in Quincy. The George Howard & Sons Company of Brockton has the general contract.

DANBURY, CONN. — Negotiations are under way between the Danbury & Bethel Gas & Electric Company and the Danbury & Bethel Street Railway Company whereby the former will lease the power plant of the latter. The large generator ordered by the lighting company before the war has been taken over by the United States government for war purposes. As the company is in need of additional facilities and as it is impossible to secure electrical equipment, it proposes to lease the power plant of the street railway company and operate it in connection with its own plant, furnishing power to operate the railway system.

BRIDGEPORT, CONN.—The Bridgeport Housing Company, 886 Main Street, is planning to build a group of two-and-a-half-story houses, to cost about $3,000,000. The United States government will provide $3,000,000 additional.

HARTFORD, CONN.—Bids are being taken by the Hartford Electric Light Company for the construction of a repair shop, 40 ft. by 186 ft., one-story, to cost about $25,000.

Middle Atlantic States

BORDER CITY, N. Y.—The local plant of the Empire Gas & Electric Company of Auburn was recently destroyed by fire, causing a loss of about $30,000. C. F. Brunt of Geneva is local manager.

HOFFMANS, N. Y.—Arrangements have been made with the Schenectady Illuminating Company to extend its service to Hoffmans. The company will install a new lighting system along the highway from the Hatcher greenhouses to the schoolhouse on the turnpike.

ILION, N. Y.—Bids are being received by the Remington Arms Company for the extensions to its plant on East Main Street, consisting of dry kiln and boiler house and storage building, to cost about $75,000.

LITTLE FALLS, N. Y.—Work, it is reported, has started on the erection of an electric transmission line from the plant of the Caroga Light & Power Company through the towns of Oppenheim, Manheim, Fairfield and Little Falls by the East Creek Power Company. This line will run into the Small Gulf power house between Little Falls and Herkimer and will furnish additional power for the New York State Railways. Extensive improvements, it is stated, are to be made at the East Creek power plant to enable it to supply more power to the industries in Schenectady, Amsterdam and Fulton County.

MALONE, N. Y.—The capital stock of the Malone Light & Power Company has been increased from $194,000 to $300,000, the proceeds to be used for extension to system.

ROCKAWAY, N. Y.—The Bureau of Yards and Docks, Navy Department, Washington, D. C., is considering the construction of a hydro-cylinder house in Rockaway, to cost about $40,000.

ROCHESTER, N. Y.—The Menihan Company is planning to erect an engine and boiler plant at its works on Portland Avenue.

UTICA, N. Y.—A permit has been granted the Utica Gas & Electric Company for the erection of a new switch house on Snipe Street at the foot of Washington Street, to cost about $100,000. Contract has been awarded for construction of building. The new switch house will be used for switching energy from the hydroelectric plant at Trenton Falls and is to be used in conjunction with the new double-circuit, 44,000-volt steel tower transmission line from Trenton Falls, to Utica. The purpose of the switch house primarily is to supply power to the munition plants in Utica and Ilion.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

DOVER, N. J.—Plans are under consideration by the Board of Water Commissioners for the installation of an electrically operated pumping unit at the municipal pumping plant.

JERSEY CITY, N. J.—Swift & Company are reported to be planning the erection of a boiler plant at their works on Henderson Street.

NEWARK, N. J.—The Public Service Corporation of New Jersey, up to the present time, has received a total appropriation of $2,317,895 from the United States government for extensions to the Public Service Railway Company's system and electric lines as follows: New traction lines to Newark Bay, with additional cars, $21,739; extensions in traction lines at Camden and Gloucester City, including 33 cars, extensions to electric lines, etc., $1,240,780, and for electric construction and development work for the New York Shipbuilding Corporation at the recently established Yorkship Village, Gloucester City, $215,000, and for new electric feeders and other work at Kearney, $39,586.

DIXMONT, PA.—Contract has been awarded by the Board of Trustees of the Dixmont Hospital for the Insane, to D. T. Riffle, Keeman Building, Pittsburgh, for the erection of an electric power plant at the institution.

HOOVERSVILLE, PA. — The Public Service Commission has granted the petition of the borough of Hooversville to institute condemnation proceedings to acquire the local plant of the United Light, Heat & Power Company of Stoyestown. The borough will issue bonds to cover the cost of acquiring the plant and will purchase energy from the Penn Public Service Company, a subsidiary of the Citizens' Light, Heat & Power Company of Johnstown.

JOHNSONBURG, PA. — Arrangements have been made by the Johnsonburg Light & Power Company to issue $45,000 in capital stock and $25,000 in bonds, the proceeds to be used for extensions and improvements.

PHILADELPHIA, PA.—The Department of Public Works is considering remodeling the boiler plant and coal conveying system at Lardner's Point, involving an expenditure of about $50,000.

PHILADELPHIA, PA.—Plans are under consideration by the Emergency Fleet Corporation for the construction of a steam-driven electric power plant at the Hog Island shipyards.

PHILADELPHIA, PA.—Plans, it is reported, are under consideration by the Otis Elevator Company, Sixteenth and Sansom Streets, for the construction of a two-story addition, 80 ft. by 155 ft., on Shackamaxon Street, to cost about $50,000.

ST. MARY'S, PA.—The St. Mary's Electric Light Company has increased its capital stock by $225,000 and issued $100,000 in bonds. The proceeds, it is understood, will be used for extensions to its electric power plant and distributing system.

SCRANTON, PA.—The linking together of all electric generating plants of the coal fields, particularly of Lackawanna and Luzerne Counties, is reported to be under consideration. Investigations are now being made by F. C. Cole, state director of conservation for the federal Fuel Administrator, for the electric generating plants in both counties. The plan as outlined would mean the connecting up of the various plants and an interchange of service.

WILMINGTON, DEL. — Arrangements have been made by the Pennsylvania Electric Company, Du Pont Building, Wilmington, for an issue of $1,500,000 in notes, the proceeds to be used for extensions, improvements, etc. The company operates the Citizens' Light, Heat & Power Company of Johnstown, Pa.; the Penn Electric Service of Somerset, Pa., and the Penn Public Service Company of Clearfield.

SWISS, W. VA.—The Kanawha Collieries Company, Charleston National Bank Building, Charleston, recently organized, is now developing 1200 acres of coal land and plans to develop 2700 acres eventually. Complete equipment will be installed, including conveyor or incline cars, tipple machinery, railway and electrical machinery.

ST. JULIEN'S, VA.—Contract has been awarded by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for construction of a power house at St. Julien to Johansen & Kierman, Norfolk, at $12,963.

WASHINGTON, D. C.—Contract has been awarded by the Thomas Jefferson Hotel Company to the George A. Fuller Company, Munsey Building, for the construction of an apartment hotel, at Fourteenth and Q Streets, N. W., including three electric elevators, electric lighting, steam heating, etc., to cost about $400,000.

WASHINGTON, D. C.—Contract has been awarded by the United States Housing Corporation to Richardson & Burgess, Inc., Colorado Building, construction of dormitories, etc., for housing navy yard employees, at Seventeenth and D Streets, to cost $125,000; heating plant, $45,000, and electric lighting $7500.

WASHINGTON, D. C.—Bids will be received at the General Engineer Depot, United States Army, 1438 You Street, Washington, until Sept. 17, under Proposal 1098, for furnishing 604 transformers. Bids will be received until Sept. 20 under Circular 1107, for 60,000 ft. two-conductor cable and 50 reels. Further information may be obtained upon application to the purchasing officer at the above office.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations supplies as follows: Until Sept. 19, Gloucester, N. J., Schedule 5790½—storage batteries. Until Sept. 20, Eastern delivery, Schedule 5811½—mechanical engine telegraph systems. Until Sept. 27, Puget Sound, Wash., Schedule 5850½—threading machine, six bench drills, two direct-current motors, one magneto chuck and two turret lathes. Bids will also soon be asked for the following supplies: Puget Sound, Wash., Schedule 5845½—seven switchboards; Schedule 5846½—fourteen turbo-generator sets. Mare Island, Cal., Schedule 5847½—1,000,000 ft. silicon bronze wire and 3300 ft. bronze wire; also 3300 ft. bronze wire for Philadelphia, Pa. Yorkton, Va., Schedule 5853½—generating equipment; Schedule 5853½—two or more boilers. Brooklyn, N. Y., Schedule 5854½—one motor-generator set. Iona Island, N. Y., Schedule 5856½—four electrical hoists. Cape May, N. J., Schedule 5857½—electrical equipment. Application for proposal blanks should designate the schedule desired by number.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations supplies as follows: Norfolk, Va., Specification 3309—four 10-ton electric traveling cranes of the overhead bridge type, equipped with two 5-ton trolleys, to be delivered at Hampton Roads. Cape May, N. J., Specification 3386—heating water supply and electric system, estimated to cost about $80,000. Indian Head, Md., Specification 3365—construction of nitrate plant, to cost about $180,000. Until Sept. 16, Hampton Roads, Va., Specification 3292—boiler plant building, to cost about $150,000. Philadelphia, Pa., Specification 3297—construction of hospital building at Gray's Ferry Hospital, date extended from Aug. 29 to Sept. 16; Specification 3367—elevator for Gray's Ferry Naval Hospital; Specification 3368—laundry equipment for Gray's Ferry Hospital, to cost about $12,000. Melville, R. I., Specification 3391—radio building, masts and towers, to cost about $66,000. Application for proposal blanks should designate the specification desired by number.

North Central States

ESCANABA, MICH.—The City Council is considering extending the lighting district on Four River Road.

VERMONTVILLE, MICH.—One of the large transformers in the local substation of the Thornapple Gas & Electric Company of Hastings was recently destroyed by fire.

CINCINNATI, OHIO.—The Procter & Gamble Company is contemplating an extension to its power plant, to cost about $65,000.

HAMILTON, OHIO.—The Ford Company has petitioned for permission to erect a wire on the city poles from the plant of the Hamilton & Ross Hydraulic Company to its new plant at the north end of Fifth Street. This is only a temporary arrangement, as the company will have its power plant.

TOLEDO, OHIO.—The United States government has taken over the entire construction of the nitrate plant to be erected near Toledo. Under the original plan the

plant was to be erected and operated by the Air Nitrate Corporation of New York for the government. The reason for taking over the plant by the government is that it can be built more quickly and cheaper than a private company which cannot commandeer material, labor, transportation, etc.

TOLEDO, OHIO.—The construction of several buildings, including a machine shop, laboratory, storehouse, pipe shop and benzol laboratory, is under consideration by the Toledo Furnace Company. F. C. Warner, Hippodrome Building, Cleveland, is architect.

TOLEDO, OHIO.—The Doehler Die Castings Company of Toledo has begun work on an extension to its machine shop, 50 ft. by 160 ft., four stories and basement, and extension to foundry, 50 ft. by 120 ft. The extensions will be used for the manufacture of airplane bearings and other war products.

LOUISVILLE, KY.—At the request of the Board of Public Works the Louisville Gas & Electric Company has begun a survey of the City Hall and annex with a view of preparing an estimate of supplying the buildings with electricity. Heretofore the City Hall and other municipal buildings have been supplied with power by the city power plant in the basement. The inability to secure competent help is given as the cause for asking the company for estimates.

LOUISVILLE, KY.—Contract has been awarded to Chester & Fleming, of Pittsburgh, Pa., for construction of the new cantonment to be established by the Ordnance Department, Washington, D. C., at Camp Knox. An electric lighting system, pumping plant, water-works and sewerage systems will be installed. The cost of the entire work is estimated at over $20,000,000.

LOUISVILLE, KY.—Thomas L. Barrett, 123 Third Street, Louisville, is asking prices on a 100-kw., three-phase, 60-cycle, 2300-volt generator, a belt-driven machine preferred.

STITHTON, KY.—Plans, it is reported, have been completed by the Louisville Gas & Electric Company for extending its electric transmission lines to Stithton to supply electricity for lamps and motors at the new artillery camp here. The cost of the extension, it is understood, will be paid by the United States government.

GREENCASTLE, IND.—The Wabash Valley Electric Company of Clinton has petitioned the Commissioners of Putnam County for a franchise to erect an electric transmission line through Madison and Greencastle Townships. The company, which recently purchased the local plant, will transmit electricity from its Clinton plant to operate the local system and will probably close down the power house here.

PERU, IND.—Bonds to the amount of $15,000 have been sold, the proceeds to be used for the installation of a new power unit at the municipal electric light and power plant.

CHICAGO, ILL.—Plans have been prepared by Armour & Company for the erection of a nine-story cooler and storage building at Packers Avenue and Forty-fourth Street, to cost about $1,500,000. R. C. Clark is architect for the company.

CHICAGO, ILL.—Preparations are being made by Swift & Company for the erection of a five-story cold-storage plant at Forty-second and Cook Streets, to cost about $350,000. The company has been granted a permit to build a six-story soap-manufacturing building, to cost about $30,000.

EAST ST. LOUIS, ILL.—The American Manufacturing Company, South Eleventh Street, St. Louis, Mo., is erecting a new power plant, 50 ft. by 90 ft., in East St. Louis, to cost about $40,000.

TYLER, MINN.—The municipal electric plant was wrecked by a cyclone on Aug. 22.

CAMP DODGE, IOWA.—Work will soon begin on the construction of 700 additional buildings, including barracks for 8537 men, at Camp Dodge, to cost about $2,500,000.

EARLHAM, IOWA.—The Madison County Mutual Rural Electric Company, No. 2, has been granted a franchise by the Board of Railroad Commissioners to erect and maintain an electric transmission line on certain roads and highways in Madison County. Electricity for operating the system will be obtained from the municipal electric plant at Earlham. M. A. Tharp is interested in the company.

FORT MADISON, IOWA.—Plans have been completed by the Atchison, Topeka & Sante Fé Railroad Company for the construction of a power plant at Shopton, Iowa, near Fort Madison. The company will also build extensive freight and passenger facilities at Tulsa, Okla.

HARRISONVILLE, MO.—The taxpayers have voted to accept the proposal of L. K. Green & Sons of Pleasant Hill, to lease the municipal electric plant for a period of ten years. It is proposed to dismantle the local plant and furnish electricity from the electric plant at Pleasant Hill. Work on the erection of the transmission line between Harrisonville and Pleasant Hill is under way. L. K. Green of Pleasant Hill is president of the company.

KANSAS CITY, MO.—Joseph F. Porter, president of the Kansas City Light & Power Company, has announced that the government has released sufficient steel to complete the new power house of the company, now under construction at the foot of Brooklyn Avenue. It is expected to have the new plant in operation by next spring.

ST. LOUIS, MO.—Work has begun on the construction of a new plant for the Oliver Electric & Manufacturing Company.

ST. LOUIS, MO.—The Ajax Electric Specialty Company, 1401 Morgan Street, recently organized, it is reported, would like to receive prices on machinery for the manufacture of flashlights, telephones, and plural plug sockets. Ernest Alschuler is president.

UNIVERSITY, N. D.—Rose & Harris, 471 Auditorium Building, Minneapolis, Minn., have been engaged to prepare preliminary plans for a power plant for the State University, to cost about $150,000.

NEBRASKA CITY, NEB.—The Lincoln Telephone & Telegraph Company has purchased a site in Nebraska City on which it proposes to erect a telephone exchange building.

CONCORDIA, KAN.—The Concordia Electric Light Company, which recently installed an electric lighting system in Agenda is contemplating extending its service to the town of Cuba.

GLEN ELDER, KAN.—The local electric light plant was recently destroyed by fire.

Southern States

BELHAVEN, N. C.—Bonds to the amount of $25,000 have been issued for the installation of an electric lighting system in Belhaven.

WILMINGTON, N. C.—Extensive additions and improvements, it is reported, are contemplated by the Tidewater Power Company, including doubling the output of its power plants, installation of new equipment, doubling street-car tracks, etc.

JACKSON, GA.—The Citizens' Ice & Cold Storage Company, recently organized, is planning to build an ice plant of 10 tons daily capacity. The plant will be equipped with electrically driven machinery and cold-storage facilities. W. E. Merck is interested in the project.

COLUMBUS, MISS.—An appropriation of $24,500 has been made for repairs and improvements at the Mississippi Industrial Institute and College, of which $10,000 will be used for the installation of new boilers at the power house.

BIRMINGHAM, ALA.—Contracts have been awarded by the Birmingham Steel Corporation for construction of plant (initial unit), to cost $1,000,000, including the erection of buildings and furnishing machinery. The mechanical equipment include power plant, shears, punches, benders, etc. The plans provide for future increase costing between $15,000,000 and $20,000,000. Henry L. Brittain of New York, N. Y., is president.

OKMULGEE, OKLA.—Bids will be received at the office of R. H. Jenness, city commissioner of finance, Okmulgee, until Sept. 25, for waterworks improvements, including repairs to present dam, building retaining wall, constructing intake chamber, pumping station building, filter house, machinery foundations; filter equipment consisting of four 1,000,000-gal. units, installed; one 3,500,000-gal. direct-acting, triple-expansion pumping engine, and two boiler-feed pumps; two 150-hp. water-tube boilers, heater, gas and oil burners, breeching, etc.; one 100-kva. engine-driven generating set and switchboard; one 48-in. by 100-ft. chimney, erected; including installation work, sluiceways, suction and discharge piping, installation of pumps, boilers, engine and generator, wiring switchboard, electrical connections, rebuilding transmission lines, etc.; also for cast-iron pipe, fire hydrants and furnishing material and constructing extensions to sewer system, construction of ejector station and sewage treatment plants, etc., Burns & McDonnell, Interstate Building, Kansas City, Mo., are engineers.

Pacific and Mountain States

CHEHALIS, WASH.—The Superior Coal Company is installing electrical equipment at its mine in Chehalis. Electricity will be furnished by the North Coast Power Company. D. W. Proebstel, electrical engineer of Portland, Ore., has charge of the installation.

USK, WASH.—The Mountain States Power Company is contemplating the erection of an electric transmission line from Usk to Chelewah, a distance of 25 miles, to supply electricity in the latter plant. The cost of the work is estimated at $90,000. G. N. Rooker is manager of the power company.

YAKIMA, WASH.—A movement is on foot to irrigate thousands of acres of arid land in Walla Walla and Franklin Counties. The proposed project includes the construction of a large dam at Five Mile Rapids on Snake River and construction of a hydroelectric power plant. Investigations are being made by R. K. Tiffany, project manager of the government systems in the Yakima Valley, and A. P. Davis, director and chief engineer of the United States Reclamation Department.

GAZELLE, CAL.—Application has been made to the State Water Commission by Edward C. Latchem to utilize 12 sec.ft. of water in Grouse Creek to be used for power purposes. The company is planning to develop 400 hp. of electrical power for its mining properties.

GLENDALE, CAL.—The city of Glendale has been advised that the Capital Issues Committee of San Francisco has approved the bond issue recently voted in Improvement District No. 2 for $44,000 to purchase the distributing system of the Southern California Company there.

INGOT, CAL.—The construction of an electrolytic plant at its mines is reported to be under consideration by the Afterthought Copper Company.

LOS ANGELES, CAL.—Plans have been approved by the City Power Commission for the construction of power plant No. 2 of the municipal power system along the route of the aqueduct, at San Francisquito Canyon, to cost about $1,400,000. The plans provide for a development of 28,000 hp. E. F. Scattergood is electrical engineer.

LOS ANGELES, CAL.—The Board of County Supervisors has granted the Southern California Edison Company a franchise for the erection of a new electric transmission line on a portion of the county highways to connect with the present system. A franchise has also been granted for the construction of a distributing system in connection with the new transmission line.

MANHATTAN BEACH, CAL.—The installation of new ornamental lamp standards and appliances on Neptune Avenue and other streets is under consideration by the City Trustees.

MONROVIA, CAL.—Plans have been prepared by the Southern California Edison Company for the erection of a new station, 60 ft. by 100 ft., to be located at Myrtle and Walnut Avenues. Joseph F. Rhodes, Central Building, Los Angeles, is architect.

SAN FRANCISCO, CAL.—The supervisors have passed an ordinance authorizing the Board of Public Works to enter into a contract for furnishing and installing an 8-in. centrifugal pump and motor at the Commercial Street pumping station.

SANTA BARBARA, CAL.—Plans are under consideration by the City Council for the installation of an electric lighting system on Anapamu Street from State to Anacapa Street.

SAN FERNANDO, CAL.—The San Fernando Canning Company is planning to construct a new plant in San Fernando, at a cost of about $45,000. The proposed plant will be equipped for electrical operation and large boilers will be installed.

MINIDOKA, IDAHO.—Bids will be received by the United States Reclamation Service, Department of the Interior, Denver, Col., until Oct. 1, for extension of power plant and furnishing hydraulic turbine and generator for the Minidoka reclamation project.

GLOBE, ARIZ.—The Iron Cap Copper Company, it is reported, is considering improvements to its property, including the installation of an electric power plant.

Miscellaneous

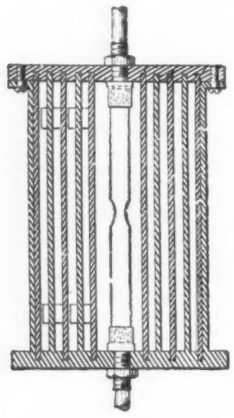
PANAMA.—Bids will be received at the office of the general purchasing officer of the Panama Canal, Washington, D. C., until Sept. 28, for furnishing, under circular No. 1230, cut-outs, electric switches, sockets, truck, lights, magnesia pipe covering, etc.

1,275,110. ELECTRIC FUSE; Walter W. Walsh, Wilkinsburg, Pa. App. filed June 27, 1916. Fuse casing which, although strong and durable, may be easily and quickly opened to renew the fusible element.

1,275,124. SANITARY MOUTHPIECE COVER FOR TELEPHONE TRANSMITTERS; George W. Bulley, Chicago, Ill. App. filed Sept. 2, 1916. Simple, durable and reliable in construction, effective and efficient in operation, and cheap to manufacture.

1,275,141. TELEPHONE-EXCHANGE APPARATUS AND SYSTEM; John Erickson, Chicago, Ill. App. filed July 16, 1906. Applicable to automatic telephone-exchange systems of that particular type in which automatic selectors and connectors are employed at the exchange or central station.

1,275,142. TELEPHONE-EXCHANGE APPARATUS AND SYSTEM; John Erickson, Chicago, Ill. App. filed July 19, 1906. Automatic or semi-automatic telephone systems in which electrically propelled and step-by-step-actuated switching machines are employed at the exchange or central station.



1,275,110—Electric Fuse

1,275,151. PROTECTIVE MEANS FOR ELECTRICAL APPARATUS; Frank C. Green, Pittsfield, Mass. App. filed Dec. 4, 1916. Acting as secondary windings, they may absorb high-frequency energy impressed on the windings to which they are inductively related by changing into heat the electrical energy induced in them by the high-frequency currents traversing the winding they are to protect.

1,275,161. PROCESS OF ELECTRICALLY PRODUCING IRON; Axel T. C. Estelle, Hagen, Germany. App. filed Nov. 22, 1916. Production of iron by the electrolytic dissociation of a solution comprising a caustic alkali and a ferric hydrate.

1,275,170. COIL CASE AND TERMINAL; John L. Milton, Cleveland, Ohio. App. filed Aug. 17, 1917. With a terminal fitting which is at once efficient, durable, producible at a low cost and adapted to be readily secured to the wall of the case.

1,275,179. ELECTRIC SIGNAL; William M. Bowles, Sapulpa, Okla. App. filed Dec. 31, 1915. Provision of means for giving both an audible and visible signal in the event of the vent pipe being struck by lightning and the safety valve becoming closed, so that the attendant may be appraised of the closing of the said safety valve within the pipe and may restore the device to its normal condition.

1,275,186. AUTOMATIC TELEPHONE SYSTEM; Willis E. Lamb, Los Angeles, Cal. App. filed June 26, 1912. Systems which employ primary and secondary line switches.

1,275,195. ARMATURE CONSTRUCTION FOR DYNAMO-ELECTRIC MACHINES; Vincent G. Apple, Dayton, Ohio. App. filed Nov. 19, 1914. Highly efficient in operation and sturdy and rugged in construction.

1,275,200. ELECTRIC SWITCH; Thomas E Barnum, Milwaukee, Wis. App. filed Dec. 15, 1914. To control apparatus automatically in accordance with predetermined governing pressures.

1,275,201. SELF-PROPELLED VEHICLE; Ralph H. Beach, New York, N. Y. App. filed Sept. 15, 1914. Combines a prime mover and a secondary battery in such manner that a vehicle is provided wherein the objections inherent or existing in the use of either alone are largely obviated.

Record of Electrical Patents

Notes on United States Patents

1,275,206. ELECTRICAL INDUCTION FURNACE; Oluf C. Bockman, Notodden, Norway. App. filed May 3, 1918. To regulate the load of an induction furnace independently of the current passing through the coils of the same.

1,275,234. REGISTERING MECHANISM; James D. Elson, Chicago, Ill. App. filed March 1, 1912. For use in connection with electrically propelled vehicles for registering the number of stops made by the vehicle.

1,275,261. FILLING DEVICE OR VALVE FOR STORAGE BATTERIES OR OTHER RECEPTACLES; Miller R. Hutchinson, West Orange, N. J. App. filed July 18, 1914. For filling or replenishing cells of storage batteries equipped with safety devices or traps.

1,275,279. CONDUIT OR CONDUCTOR; George A. Lutz, Cranford, N. J. App. filed Jan. 25, 1915. An insulated conductor or cable with a metallic covering substantially in the form of spiral-like winding secured together against longitudinal displacement.

1,275,292. IGNITION AND LIGHTING APPARATUS; Alfons H. Neuland, San Francisco, Cal. App. filed Sept. 19, 1916. For providing ignition for internal-combustion engines and also for providing electric current for lighting or other purposes.

1,275,294. COMBINED INTERNAL-COMBUSTION ENGINE AND MAGNETO; Richard A. Oglesby, South Bend, Ind. App. filed Jan. 5, 1917. To provide a crankcase head that shall at the same time support a magneto armature and provide a bearing for the crank shaft.

1,275,305. ELECTRIC INCANDESCENT LAMP; Howard B. Rand, Merrimac, Mass. App. filed Dec. 18, 1917. The neck or base of an incandescent lamp may be readily converted from a double to a single contact base, and from a single to a double contact base, without change in the number of component parts.

1,275,309. SWITCH; John Schneider, New York, N. Y. App. filed April 13, 1914. For the control of high-tension electric currents.

1,275,326. AIR-BREAK SWITCH; John R. Townsend, Chicago, Ill. App. filed Nov. 26, 1915. To open a high-tension circuit quickly and surely without the formation of a destructive arc and without danger of enabling the current to strike from one of the parallel conductors or phases to another, thus causing short-circuiting of the system.

1,275,391. CUT-OUT; Robert C. Cole, Hartford, Conn. App. filed Oct. 3, 1917. Adapted for use between main lines and transformer or branch circuits.

1,275,407. AUTOMATIC LIMIT SWITCH; Edward L. Dunn, Worcester, Mass. App. filed Sept. 18, 1913. For drum elevator machines wherein the circuits are automatically opened as the car approaches either limit, in order to prevent overrunning.

1,275,408. ART OR METHOD OF ETCHING STEEL OR OTHER LIKE PLATES; William S. Eaton, Sag Harbor, N. Y. App. filed Nov. 28, 1916. To facilitate the rapid production of accurate master or pattern plates for use upon pantographic engraving or other similar machines.

1,275,417. APPARATUS FOR PRESERVING ORGANIC MATERIALS BY THE USE OF X-RAYS; App. filed April 14, 1917. To sterilize insects and prevent the further propagation of their species, and also to destroy any eggs that they may have already laid.

1,275,442. CARTRIDGE FUSE; Oscar H. Jung, Milwaukee, Wis. App. filed May 19, 1917. To produce an inexpensive and simply constructed refillable fuse in which the fusible strip is inclosed.

1,275,448. ELECTRIC ACCUMULATOR; Henry Leitner, Westminster, London, Eng. App. filed Feb. 1, 1918. Makes use of a non-conducting support of wood, or wood-pulp, or other preparation of wood which is preferably of a porous nature.

1,275,451. WARMER FOR FOOTWEAR; William W. Lillard, Irvington, N. J. App. filed Nov. 2, 1917. To permit of readily applying the warmer to the footwear.

1,275,458. BRUSH HOLDER FOR COMMUTATOR MECHANISM; Charles R. Meston and Herbert I. Finch, St. Louis, Mo. App. filed May 16, 1917. To provide a commutator brush holder which contributes to economy, both in manufacturing cost and in operating cost.

1,275,468. CONDENSER AND METHOD OF MAKING THE SAME; Albert Pruessman, Berwyn, Ill. App. filed July 27, 1917. To prevent a permanent change in their electric constants as a result of normal temperature changes.

1,275,469. FLEXIBLE CONDUCTOR; Albert Pruessman, Berwyn, Ill. App. filed Oct. 17, 1917. Used in making tinsel cords for connecting telephones in circuit, making connections at telephone switchboards and other similar indoor uses.

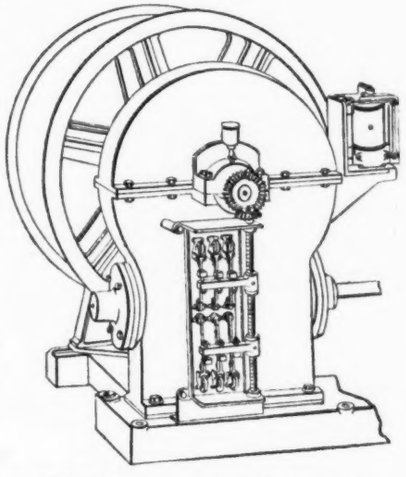
1,275,474. TELEGRAPHIC PRINTING APPARATUS; Matia B. Rodriguez, London, Eng. App. filed March 20, 1916. Transmitted messages are recorded by printing mechanism incorporated in the receiving apparatus.

1,275,480. ELECTRICAL SYSTEM FOR CONTROLLING BOATS OR TORPEDOES; James M. Seymour, Newark, N. J. App. filed April 26, 1917. For discharging or exploding at will an explosive charge carried by the boat or torpedo.

1,275,501. APPARATUS FOR STRINGING WIRES; Theodore Turanyez, Goodeve, Saskatchewan, Canada. App. filed April 19, 1917. For telephones and telegraphs.

1,275,524. ELECTRIC CONNECTOR FOR SECURELY RETAINING PLUGS; Victor Henri Broc, Levallois-Perret, France. App. filed April 13, 1918. Made for industrial purposes, and especially for motor cars and flying machines.

1,275,536. PROTECTIVE DEVICE FOR MOTOR COMPRESSORS; Philip L. Crittenden, Edgewood, Pa. App. filed April 21, 1915. To provide means for automatically cutting out the motors, in case either one of the motors becomes disabled.



1,275,407—Automatic Limit Switch

1,275,541. CIRCUIT CONTROLLER; Merritt Drane, Louisville, Ky. App. filed Dec. 23, 1916. For an electrically operated signal device.

1,275,542. CATHODE FOR X-RAY TUBES; Francis J. Farrelly and Alfred Greiner, Hartford, Conn. App. filed Dec. 28, 1914. Will increase the life of the X-ray tube by eliminating to a large extent the danger of cracking the glass at what is termed the cathode neck.

1,275,552. AUTOMATIC SWITCH FOR ELECTRIC IRONS; John C. Griesel, Pottsville, Pa. App. filed Feb. 20, 1918. To provide a switch which, when the iron is placed upon a suitable stand, automatically causes the opening of the circuit, and when the iron is removed from the stand the circuit becomes automatically closed.

1,275,559. AUXILIARY SIGNAL ARRANGEMENT FOR PRINTING-TELEGRAPH SYSTEMS; Walter A. Houghtaling, Dunellen, N. J. App. filed May 8, 1915. Means whereby the more usual service signals such as "start," "stop," "rerun," "repunch," ets., and like service signals of frequent occurrence, may be transmitted easily and rapidly and with minimum of interference with the regular operation of the circuit.